Roadmap to Microsoft Excel Documentation

If you are new to spreadsheets or to Microsoft Excel	*If you are familiar with Lotus 1-2-3*	*For all users*	
■	■	■	For instructions on installing and starting Microsoft Excel, see ***Getting Started.***
■			For a hands-on tutorial, see "Learning Microsoft Excel" in ***Getting Started.***
■			For a set of online lessons about Microsoft Excel, see the **Microsoft Excel Tutorial.** Start the tutorial by double-clicking the Microsoft Excel Tutorial icon in the Microsoft Excel folder.
		■	For complete information on using Microsoft Excel, including procedures, tips, and troubleshooting, see the ***User's Guide.***
	■		To learn how Microsoft Excel differs from Lotus 1-2-3 and how to convert files, see Chapter 2, "Using Lotus 1-2-3 with Microsoft Excel" in the ***User's Guide.***
		■	For a description of the sample worksheet models and macros included on your Microsoft Excel disks, see Appendix B, "Microsoft Excel Library" in the ***User's Guide.***
		■	For complete descriptions of all worksheet and macro functions, see the ***Function Reference.***
	■	■	For instant access to reference information on your computer screen, use online **Help.** Choose Help from the Microsoft Excel Window menu.
■			For a guide to the Microsoft Excel screen, see the ***Quick Reference.***
		■	For a list of keyboard shortcuts and capsule descriptions of worksheet functions, see the ***Quick Reference.***
	■		For a conversion table of Lotus 1-2-3 commands, see the ***Quick Reference.***

User's Guide

Spreadsheet with Business Graphics and Database

Version 3.0
Apple® Macintosh™ Series

Microsoft Corporation

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Table of Contents

Before You Begin *... ix*
Using This Book ... ix
Conventions in Microsoft® Excel Documentation ... xii
Microsoft Product Support ... xiv

Part 1 **Introduction to Microsoft Excel**

Chapter 1 Microsoft Excel Basics *... 3*
Installing Microsoft Excel ... 3
Starting Microsoft Excel ... 4
Choosing Commands ... 5
Using Help ... 16
Working with Windows ... 20
Using the Mouse ... 27
Using Keyboard Shortcuts ... 29

Chapter 2 Using Lotus 1-2-3 with Microsoft Excel *... 37*
Some Things You Need to Know ... 37
Performing Common 1-2-3 Tasks in Microsoft Excel ... 42
Moving Worksheets Between 1-2-3 and Microsoft Excel ... 51
Linking 1-2-3 Worksheets and Microsoft Excel Worksheets ... 57

Part 2 **Worksheets**

Chapter 3 Creating and Using a Worksheet *... 61*
Creating a New Worksheet ... 61
Opening an Existing Worksheet ... 67
Selecting Cells and Moving Around the Worksheet ... 69
Entering Worksheet Data ... 79
Editing Worksheet Data ... 95
Entering a Formula ... 105
Using Worksheet Functions to Simplify Formulas ... 125
Saving a Worksheet ... 129
Closing a Worksheet Window ... 137
Deleting a Worksheet ... 138

Chapter 4 Editing a Worksheet ... 141
Moving and Copying Data and Formats ... 141
Inserting Cells, Rows, and Columns ... 158
Clearing and Deleting Cells, Rows, and Columns ... 159
Finding and Replacing Cells and Data ... 161
Sorting Data ... 171

Chapter 5 Formatting a Worksheet ... 175
Formatting Worksheet Data ... 175
Aligning Worksheet Data ... 186
Changing Column Widths and Row Heights ... 191
Formatting with Borders and Shading ... 196
Formatting with Cell Styles ... 198
Changing How Your Worksheet Is Displayed ... 206
Printing Your Worksheet ... 213

Chapter 6 Organizing and Documenting a Worksheet ... 215
Naming Cells and Formulas ... 215
Outlining a Worksheet ... 225
Adding Comments to a Worksheet ... 234
Auditing a Worksheet ... 242

Chapter 7 Analyzing and Calculating a Worksheet ... 253
Creating a Series of Dates or Numbers ... 253
Projecting Figures Using a Data Table ... 256
Creating a Lookup Table ... 267
Creating and Using an Array Formula ... 268
Seeking a Value That Solves a Formula ... 282
Using Iteration to Solve a Circular Reference Formula ... 283
Controlling Calculation ... 285

Chapter 8 Working with Data from Multiple Documents ... 293
Editing Worksheets as a Group ... 293
Linking Documents ... 299
Creating Publishers and Subscribers ... 317
Embedding Objects ... 321
Consolidating Data from Multiple Worksheets ... 324
Exchanging Data Using the Clipboard ... 331
Exchanging Documents with Other Applications ... 334
Using Dynamic Data Exchange (DDE) in Command Macros ... 337
Transferring Files with Microsoft Mail ... 341

Part 3 **Databases**

Chapter 9 Creating and Using a Database on a Worksheet ... 347
Creating a Database ... 347
Sorting a Database ... 352
Maintaining a Database with a Data Form ... 356
Creating a Custom Data Form ... 365

Chapter 10 Analyzing and Reporting Database Information ... 369
Using Worksheet Criteria ... 369
Finding Records ... 379
Extracting Records ... 381
Deleting Records ... 384
Using Database Functions ... 386

Part 4 **Charts**

Chapter 11 Creating a Chart ... 391
Creating a New Chart ... 391
Changing the Chart Type or Format ... 408
Creating an Overlay Chart ... 422
Saving a Chart ... 427
Closing a Chart ... 431

Chapter 12 Editing a Chart ... 433
Opening an Existing Chart ... 433
Selecting Items in a Chart ... 435
Adding, Editing, and Deleting Chart Data ... 438
Deleting a Chart ... 448

Chapter 13 Formatting a Chart ... 451
Adding, Deleting, and Formatting a Legend ... 451
Adding, Deleting, and Formatting Axes ... 457
Adding, Deleting, and Formatting Gridlines ... 467
Adding, Deleting, and Formatting a Chart Arrow ... 469
Adding, Deleting, and Formatting Text ... 472
Formatting Chart Data Markers ... 480
Formatting the Plot Area ... 490
Formatting the 3-D Chart View ... 493
Printing a Chart ... 495

Part 5 Creating Reports and Printing

Chapter 14 Using Graphics on Microsoft Excel Worksheets ... 499
Drawing Lines and Shapes ... 499
Working with and Formatting Graphic Objects ... 502
Deleting a Graphic Object ... 517
Combining Charts, Worksheets, and Macro Sheets ... 518
Exchanging Graphics with Other Applications ... 521

Chapter 15 Printing ... 525
Setting Up Your Printer ... 525
Setting Up Your Pages ... 527
Previewing Your Pages ... 533
Printing ... 539

Part 6 Customizing and Automating

Chapter 16 Customizing the Workspace and Protecting Data ... 545
Setting Up a Workspace ... 545
Specifying a Startup Folder and Document ... 549
Creating and Using a Document Template ... 551
Creating a Custom Color Palette ... 554
Protecting Documents and Windows ... 556

Chapter 17 Creating and Using Custom Worksheet Functions ... 563
Designing a Custom Function ... 563
Writing a Custom Function ... 570
Using a Custom Function ... 573

Chapter 18 Automating Tasks with Command Macros ... 575
Creating and Opening a Macro Sheet ... 575
Recording a Command Macro ... 578
Running a Command Macro ... 582
Editing a Command Macro ... 584
Assigning a Command Macro to a Button or Other Graphic Object ... 584

Chapter 19 Designing and Writing a Command Macro ... 591
Designing a Command Macro ... 591
Writing a Command Macro ... 594
Making a Command Macro Respond to Varying Conditions ... 597
Using References and Data Types in a Command Macro ... 604
Documenting a Command Macro ... 608
Testing a Command Macro ... 609
Speeding Up or Slowing Down a Command Macro ... 613

Chapter 20 Creating a Custom Application ... 615
Designing a Custom Application ... 615
Creating a Macro That Runs Automatically ... 618
Creating a Custom Dialog Box ... 620
Using a Custom Dialog Box in a Command Macro ... 628
Creating a Custom Command ... 637
Creating a Custom Menu ... 642
Creating a Custom Menu Bar ... 645
Creating a Custom Help Topic ... 646
Creating Add-in Functions and Command Macros ... 647
Using a Code Resource as a Custom Function ... 649
Creating an International Macro Sheet ... 651

Appendix A Features and Specifications ... 655
Program ... 655
Worksheets ... 656
Charts ... 660
Application Development ... 662
Data Exchange ... 664

Appendix B Microsoft Excel Library ... 667
Using the Sample Models ... 667
Using the Add-in Macros ... 672
Creating Your Own Models ... 693
For More Information ... 696

Appendix C Using Microsoft Excel with Networks ... 699
Running Microsoft Excel from a Network Computer ... 699
Using Documents on a Network ... 700
Printing from a Network ... 701

Index ... 703

Before You Begin

Microsoft® Excel provides the automated business tools you need for your projections, calculations, and data analysis as well as the presentation tools you need for reporting your results:

- **Worksheets** You can store, manipulate, calculate, and analyze data such as text, numbers, and formulas on a worksheet. You can also create graphic elements such as straight lines, arc segments, rectangles, ovals, text boxes, or buttons on your worksheets or macro sheets.
- **Databases** You can conveniently manage a database on a worksheet, using standard database operations.
- **Charts** You can quickly present your worksheet data visually in a chart. You can either create a chart directly on your worksheet or you can create a chart as a separate document in a separate window. In addition to choosing one of many built-in variations of two-dimensional (2-D) and three-dimensional (3-D) chart types, you can customize any chart to appear the way you want.
- **Macros** You can automate frequently performed tasks, perform specialized calculations, and customize Microsoft Excel by creating and storing your own macros on a macro sheet.

Using This Book

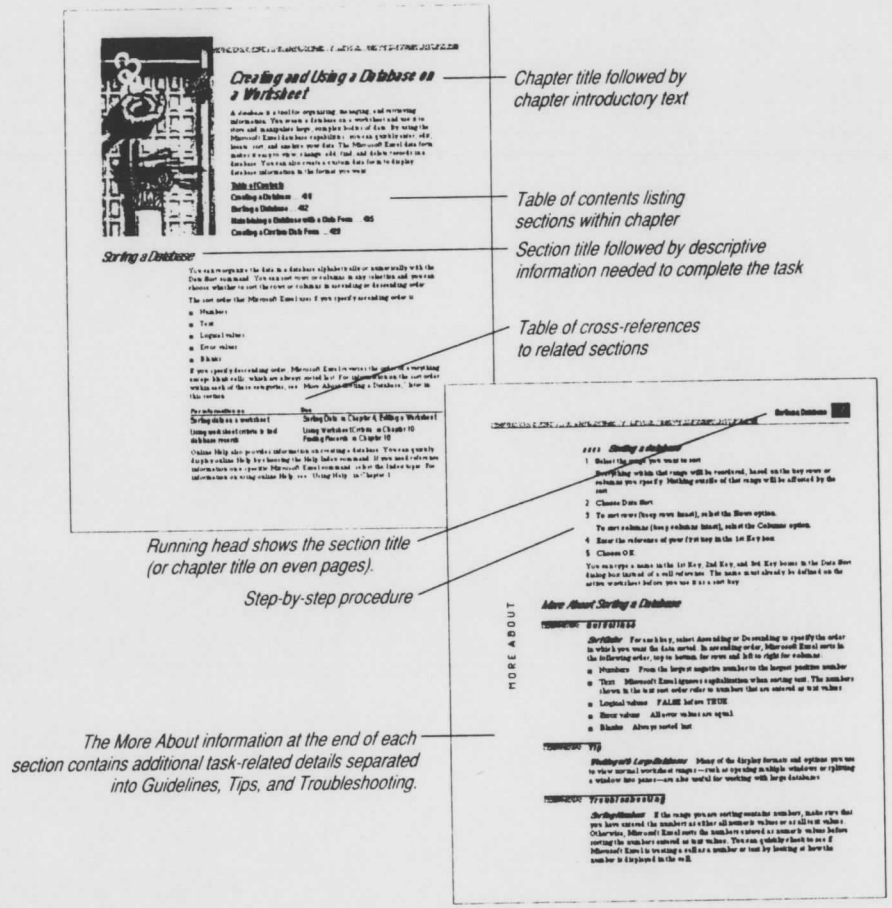
The *Microsoft Excel User's Guide* describes Microsoft Excel features and gives procedures for using them to complete the tasks you want. This book assumes that you have installed Microsoft Excel by using the procedures given in *Microsoft Excel Getting Started*.

The *Microsoft Excel User's Guide* is intended for Microsoft Excel users of all proficiency levels. The information is organized into chapters that describe a particular task and list the procedures to accomplish the task you want. For example, if you want to create a chart from your worksheet data, you would turn to Chapter 11, "Creating a Chart."

Each chapter is divided into several sections. To help you find the information you want, each section begins with a brief introduction followed by a table of cross-references to related sections.

A table of contents and an index are also provided. In addition, a table of contents for each part lists the chapters in that part, and a table of contents for each chapter lists the sections in each chapter.

The following illustration shows you how the information is presented in a chapter.


Chapter title followed by chapter introductory text
Table of contents listing sections within chapter
Section title followed by descriptive information needed to complete the task
Table of cross-references to related sections
Running head shows the section title (or chapter title on even pages).
Step-by-step procedure
The More About information at the end of each section contains additional task-related details separated into Guidelines, Tips, and Troubleshooting.
MORE ABOUT

For example, if you want to sort the data in a database, you would read the section called "Sorting a Database" in Chapter 9. The first part of the section describes how you can use Microsoft Excel to reorganize your data and gives the procedure for sorting a database. However, if you want to know more detailed information, such as how Microsoft Excel sorts numbers that are entered as text values, you would go to "Guidelines" in "More About Sorting a Database" to find this information.

The *Microsoft Excel User's Guide* is divided into six parts, as shown in the following table:

Go to	For information on
Part 1, "Introduction to Microsoft Excel"	The basic skills you'll use while working with Microsoft Excel. In addition to describing how to use online Help when you need a question answered quickly, this part also describes how to use the mouse and keyboard and how to work with windows, menus, commands, and dialog boxes. A list of keyboard shortcuts is also provided. If you use Lotus 1-2-3, you can read Chapter 2, "Using Lotus 1-2-3 with Microsoft Excel," to learn how 1-2-3 compares to Microsoft Excel and how you can convert your 1-2-3 files to Microsoft Excel files.
Part 2, "Worksheets"	Creating, using, editing, formatting, organizing, documenting, and calculating a worksheet. This part also describes how to work with data from multiple documents.
Part 3, "Databases"	Creating, using, and sorting a database on a worksheet, as well as using the database functions. This part also gives instructions for using the data form, a tool that simplifies many database operations.
Part 4, "Charts"	Creating, editing, and formatting a chart.
Part 5, "Creating Reports and Printing"	Creating graphic objects with the tool bar, combining them with your Microsoft Excel documents, and exchanging graphics with other applications. This part also describes how to set up your printer and format your document for printing, and how to preview your pages and print your document.
Part 6, "Customizing and Automating"	Setting up your workspace based on your preferences for window arrangement and display colors. This part also describes how to create document templates, protect the data in your documents, write a custom function, design and create command macros to automate tasks, and create custom applications by using custom dialog boxes and custom menus.

Following Part 6 are several appendixes, which include specific information about Microsoft Excel features and specifications, instructions for using the sample macro library and for creating your own worksheet models, and information on using Microsoft Excel with networks.

Microsoft Excel also includes a context-sensitive online Help system: By pressing COMMAND+SLASH (/), you can get explanations of commands, dialog box options, and screen messages. For information on using online Help, see "Using Help" in Chapter 1.

Conventions in Microsoft Excel Documentation

Before you start using Microsoft Excel, it's important to understand the terms and notational conventions used in the documentation.

General Conventions

- The word "choose" is used for carrying out a menu command or a command button in a dialog box.
- The word "select" is used for highlighting the part of the worksheet, chart, or macro sheet that you want your next action to affect, and for selecting a specific dialog box option.
- Commands you choose are given with the menu name preceding the command name. For example, the phrase "Choose File Open" tells you to choose the Open command from the File menu. This naming convention describes the sequence you follow in choosing a command—first you select the menu, and then you choose the command.
- The phrase "Choose OK" means that you can either click the OK button with the mouse or press the ENTER key on the keyboard to carry out the action you want.
- **Bold** type in text and procedures indicates words or characters you type.
- *Italic* type indicates important terms introduced in the section. Titles of other books in the Microsoft Excel package, such as the *Microsoft Excel Function Reference*, also appear in italic type.
- Bulleted (■) lists, such as this one, provide information but not procedural steps.
- To make it easy to locate procedures in the text, each procedure heading is preceded by a special symbol (▮▮▮▮). A numbered list (1,2, ...) indicates a procedure with two or more sequential steps. A triangular symbol (▶) indicates a procedure with only one step.

  Whenever possible, general procedures are given that apply to both the mouse and the keyboard. When separate mouse and keyboard procedures are listed under one procedure heading, you can identify each procedure by a mouse icon (🖱) or a keyboard icon (⌨) in the left margin.

Keyboard Conventions

- Key names match the names shown on most keyboards and appear in small capital letters. For example, the Shift key appears as SHIFT.
- The RETURN key and the ENTER key usually perform the same action in Microsoft Excel. In this book, "Press ENTER" means that you can press either ENTER or RETURN, unless specifically stated otherwise.
- A plus sign (+) used between two key names indicates that you must press both keys at the same time. For example, "Press COMMAND+S" means that you press the COMMAND key and hold it down while you press the S key; this is the keyboard shortcut for saving your document.
- A comma (,) between two key names indicates that those keys must be pressed sequentially. For example, "Press PERIOD, F, O" means that you press the PERIOD key on the keypad and release it, press F and release it, and then press O and release it. This is the keyboard method for choosing the File Open command.
- The keys that you use to move around in Microsoft Excel are called *movement keys*; they include the ARROW keys (UP, DOWN, LEFT, and RIGHT), HOME, END, PAGE UP, PAGE DOWN, and their related key combinations such as SHIFT+HOME.

The following keyboard conventions apply if you're using an extended keyboard.

- *Keypad* refers to the square group of numeric keys to the right of the standard keyboard keys. You can use these keys to enter numbers, by turning on Num Lock, or you can use these keys as movement keys, by turning off Num Lock. Press SHIFT+NUM LOCK (CLEAR) to turn Num Lock on and off.
- In addition to the four ARROW keys on the extended keyboard, you can use the 2, 4, 6, and 8 keys on the keypad as ARROW keys (when Num Lock is off). The 2 key on the keypad is the DOWN ARROW key, the 4 key on the keypad is the LEFT ARROW key, the 6 key on the keypad is the RIGHT ARROW key, and the 8 key on the keypad is the UP ARROW key.
- In addition to pressing COMMAND+PERIOD to cancel an action, you can press ESC.
- In addition to pressing COMMAND+SLASH (/) to access online Help, you can press the HELP key.
- In addition to pressing PERIOD on the keypad to activate the menu bar, you can press the SLASH (/) key.

Microsoft Product Support

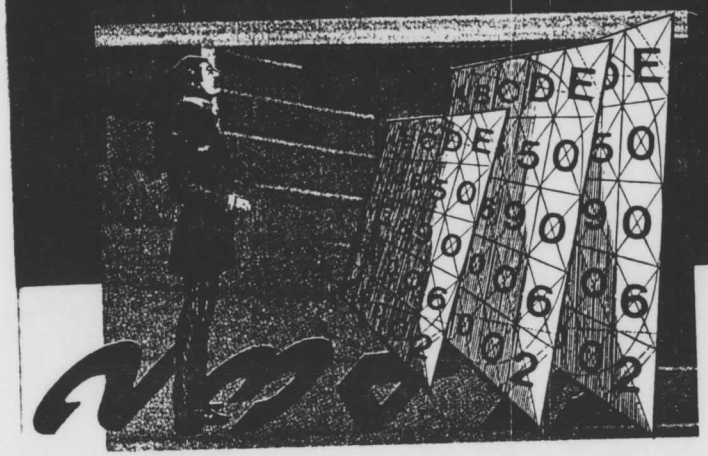
If you have a question about Microsoft Excel, first look in the *Microsoft Excel User's Guide* or consult online Help for the solution. If you cannot find the answer, contact Microsoft Product Support staff.

Within the United States, call Microsoft Product Support staff by dialing the telephone number on your registration card.

Outside of the United States, contact the Microsoft Product Support staff at the Microsoft subsidiary office closest to you. A set of stickers listing the names and addresses of all Microsoft subsidiary offices is included in your package. For future reference, you should place the sticker that lists the Microsoft Product Support office closest to you in a location that is easily accessible, such as the inside of the back cover of the *Microsoft Excel User's Guide*.

When you call, you should be near your computer and have your copies of the *Microsoft Excel User's Guide* and, if applicable, the *Microsoft Excel Function Reference* at hand. You should be prepared to give the following information:

- The version number of the product you are using
- The type of hardware you are using
- The exact wording of any messages that have appeared on your screen
- What happened and what you were doing when the problem occurred
- How you tried to solve the problem



Introduction to Microsoft Excel

Part 1 Table of Contents

Chapter 1 Microsoft Excel Basics ... 3
Learning the basics of Microsoft Excel: choosing commands, getting online Help, working with windows, and using the mouse and keyboard.

Chapter 2 Using Lotus 1-2-3 with Microsoft Excel ... 37
Using your Lotus 1-2-3 experience and data with Microsoft Excel.

Microsoft Excel Basics

Before you can use Microsoft Excel's powerful worksheet and graphics capabilities, you first need to learn some basic skills. This chapter gives instructions for installing and starting Microsoft Excel. In addition to describing how to use online Help when you need a question answered quickly, this chapter explains how to use the mouse and the keyboard to choose commands and select dialog box options, and summarizes how to work with windows.

Table of Contents

Installing Microsoft Excel ... 3
Starting Microsoft Excel ... 4
Choosing Commands ... 5
Using Help ... 16
Working with Windows ... 20
Using the Mouse ... 27
Using Keyboard Shortcuts ... 29

Installing Microsoft Excel

Your first step in using Microsoft Excel is to install Microsoft Excel on your hard disk.

For information on Microsoft Excel system requirements, see *Microsoft Excel Getting Started*.

IMPORTANT Although Microsoft Excel is not copy-protected, you may make copies only for your personal use. For complete details, please read the license agreement on the disk package.

Installing Microsoft Excel

1. Insert the disk labeled "Setup" in the disk drive.
2. Double-click the Microsoft Excel Setup icon.
3. Follow the instructions on the screen to enter your name and organization, and choose OK.

4 Decide which options you want to install. Microsoft Excel installs all of the options with check boxes turned on.

   If you don't want to install a particular option, turn its check box off.

   As you turn the check boxes on or off, compare the Total Space Required and Space Available totals in the dialog box to make sure you have enough space for the installation.

5 In the list, select the folder into which you want to install Microsoft Excel and/or the selected options.

   To create a new folder, choose the New Folder button. Type the folder name in the New Folder box and choose the Create button. The new folder is added to the list.

6 Choose the Install button.

7 Follow any further instructions that appear on the screen.

When the installation procedure is complete, you are returned to the Finder.

Starting Microsoft Excel

After you have installed Microsoft Excel, you can start the application.

Starting Microsoft Excel

1 Double-click the Microsoft Excel folder.

2 Double-click the Microsoft Excel icon to start Microsoft Excel and create a new worksheet.

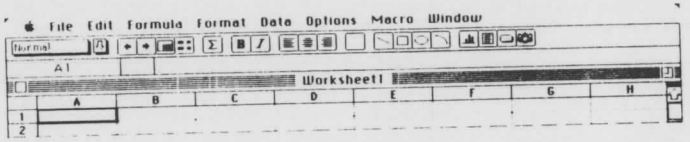
Starting Microsoft Excel and opening a document directly

You can use the Microsoft Excel icons in the Finder to start Microsoft Excel and create a new worksheet or open existing documents.

To	Double-click
Start Microsoft Excel and create a new worksheet	Microsoft Excel
Start Microsoft Excel and open an existing document	Worksheet, Macrosheet, Chart
Start Microsoft Excel and open the documents you had open when you saved the workspace	Workspace

Choosing Commands

Microsoft Excel commands are grouped on menus. The menu names appear in the menu bar displayed across the top of the screen. Depending on the type of document you're working in, a different menu bar is displayed. For example, if you're working in a worksheet or a macro sheet, you see the worksheet menu bar:



When you work in a chart, you see different menu names in the chart menu bar.

For information on	See
Opening document windows	"Opening an Existing Worksheet" in Chapter 3, "Opening an Existing Chart" in Chapter 12, and "Creating and Opening a Macro Sheet" in Chapter 18
Using, selecting, sizing, moving, and arranging windows	"Working with Windows" later in this chapter
Scrolling through a document window	"Selecting Cells and Moving Around the Worksheet" in Chapter 3
Closing document windows	"Closing a Worksheet Window" in Chapter 3
Keyboard shortcuts for choosing commands and dialog box options directly	"Using Keyboard Shortcuts" later in this chapter and the *Microsoft Excel Quick Reference*

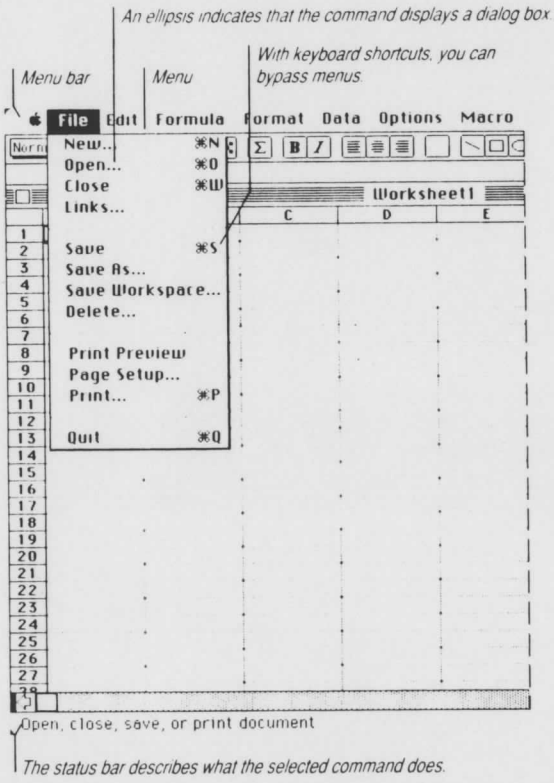
Online Help also provides information on choosing commands. To display online Help, choose the Window Help command. If you are using system software version 7.0 and the Help command does not appear on the Window menu, display Help by pointing to the Help menu icon and choosing the Microsoft Excel Help command. For information on a specific command, select the Commands topic. For information on using online Help, see the next section, "Using Help."

Choosing a Command

You choose commands from Microsoft Excel menus using the mouse the same as you do in other Macintosh programs. A description of the selected menu item appears in the status bar at the bottom of the Microsoft Excel window. You can also use the keyboard to choose commands.

When you choose a command name that is followed by an ellipsis (...), Microsoft Excel displays a *dialog box* so you can enter more information or select options before carrying out the command. A dialog box may include areas in which you enter text or numbers and view or change settings for options related to the command. Or it may simply display additional information or a request for confirmation.

You can use keyboard shortcuts to choose many of the most frequently used menu commands. On the menu, keyboard shortcuts are shown next to the command name for which they are available.



Some command names occasionally appear dimmed. This indicates that the command does not apply to the current situation or that you may need to make a selection or complete an action before choosing the command.

In Microsoft Excel, a few additional commands become available when you hold down the SHIFT key and select a menu. The following shifted commands are variations of commands normally displayed on a few worksheet and chart menus.

Regular command	Shifted command
File Close	File Close All
Edit Copy	Edit Copy Picture
Edit Fill Right	Edit Fill Left
Edit Fill Down	Edit Fill Up
Edit Paste	Edit Paste Picture
Edit Paste Link	Edit Paste Picture Link
Options Calculate Now	Options Calculate Document

Choosing a command from a menu

In Microsoft Excel, commands are referred to by the menu name and the command name. For example, the Open command on the File menu is called the File Open command.

You can choose commands with the mouse or the keyboard. The PERIOD key on the numeric keypad activates the menu bar when Num Lock is off. (When Num Lock is on, the message "NUM" appears in the status bar and pressing PERIOD enters a period. Press SHIFT+NUM LOCK (CLEAR) to turn Num Lock on or off.) When the menu bar is activated with the keyboard, Microsoft Excel underlines one letter of every menu name and command name. Each underlined letter is the one you press on the keyboard to select a menu or choose a command. For more information on displaying command and menu underlines, see "More About Choosing Commands," later in this section.

1. To display the menu that contains the command you want, point to the menu name in the menu bar.
2. Drag to the command you want to choose.

   If the command name ends in an ellipsis (...), Microsoft Excel displays a dialog box prompting you for further information after you choose the command; otherwise, Microsoft Excel carries out the command immediately.
3. If the command displays a dialog box, specify the information needed.
4. When you finish with the dialog box, click the appropriate command button to carry out the command.

   In most cases, clicking the OK button carries out the command. In a few cases, the command button that carries out the command may be labeled with a term such as Open or Find Next.

1 To activate the menu bar, press PERIOD on the numeric keypad or press the alternate menu key (assigned to SLASH (/) initially).

The File menu name appears selected, indicating that the menu bar is now active. One letter of every menu name is underlined.

2 To open a menu, press the key for the underlined letter in the name of the menu you want to display.

3 Press the key for the underlined letter in the command you want to choose.

If the command name ends in an ellipsis (...), Microsoft Excel displays a dialog box prompting you for further information after you choose the command; otherwise, it carries out the command immediately.

4 If the command displays a dialog box, specify the information needed.

5 When you finish with the dialog box, choose the appropriate command button to carry out the command.

In most cases, pressing ENTER chooses the OK button and carries out the command. In a few cases, the command button that carries out the command may be labeled with a term such as Open or Find Next and you press ENTER to choose it. To choose any other button, press COMMAND and the key for the underlined letter in the command button. To choose the Cancel button, press COMMAND+PERIOD.

For information on selecting options, entering information, and moving around in a dialog box, see "Working in a Dialog Box," later in this section.

Choosing commands with the SHIFT key

1 To select a menu with a shifted command, hold down SHIFT and point to the menu name you want.

2 Drag to the command you want to choose.

1 To select a menu with a shifted command, press PERIOD on the numeric keypad, or press the alternate menu key (assigned to SLASH (/) initially).

2 Hold down SHIFT and press the key for the underlined letter in the menu name you want.

3 Press the key for the underlined letter in the command you want to choose.

Undoing a command or action

If you change your mind or make a mistake while working on a document, you can choose the Edit Undo command to reverse certain commands and actions immediately after you complete them. The Undo command on the Edit menu changes to show the most recent command or action that is affected by Edit Undo. If Edit Undo does not apply, the words "Can't Undo" appear dimmed on the menu. Remember, you can undo only the last command you chose or the last cell entry you typed.

IMPORTANT You cannot undo the File Delete, Data Delete, or Data Extract commands.

▶ Choose Edit Undo.

Microsoft Excel changes the command name displayed on the Edit menu to Redo. If you want to reverse the Undo command itself, choose Edit Redo.

▶ Press COMMAND+Z.

Microsoft Excel changes the command name displayed on the Edit menu to Redo. If you want to reverse the Undo command itself, press COMMAND+Z again.

Repeating a command or action

If you want to repeat the last command you chose, for example when you're applying the same formats to different groups of cells, you can use the Edit Repeat command. The Edit Repeat command is available for any command that can be repeated. For example, this command is not available when you choose the File Close All command, because there would be no open windows to close. When the Edit Repeat command does not apply, the message "Can't Repeat" appears dimmed on the menu.

▶ Choose Edit Repeat.

Microsoft Excel repeats the last command you chose, including any options you changed in the dialog box.

▶ Press COMMAND+Y.

Microsoft Excel repeats the last command you chose, including any options you changed in the dialog box.

Canceling a command or closing a menu

▶ If a menu is open, click anywhere outside the menu and menu bar.

If a dialog box is open, click Cancel.

▶ To cancel a command or close a menu, press COMMAND+PERIOD.

If a dialog box is open, press COMMAND+PERIOD.

Displaying short menus or full menus

Short menus contain the commands used most frequently for routine worksheet, database, and chart tasks. Using short menus makes it easy to learn the basic commands so you can become productive quickly. Full menus contain all the commands on short menus plus commands for more advanced or specialized tasks. When you start Microsoft Excel for the first time, full menus are displayed. If you're new to Microsoft Excel, you may prefer to see short menus.

▶ To switch to short menus from full menus, choose Options Short Menus, or Chart Short Menus if the active document is a chart.

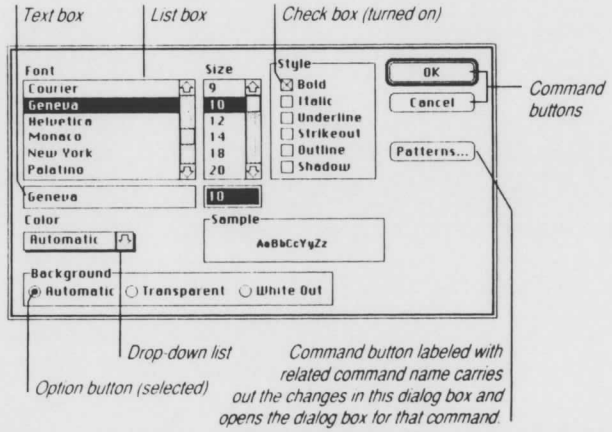
To switch back to full menus from short menus, choose Options Full Menus, or Chart Full Menus if the active document is a chart.

Working in a Dialog Box

When you choose a command that has options, Microsoft Excel displays a dialog box. A dialog box may include areas in which you enter text or numbers and view or change settings for options related to the command. Or it may simply display additional information or a request for confirmation.

A command name followed by an ellipsis (...) on a menu indicates that Microsoft Excel displays a dialog box after you choose that command. For example, the following illustration shows the Format Font dialog box that appears when you're working in a chart and choose the Format Font command. This dialog box contains most of the elements found in dialog boxes.

Some dialog box options occasionally appear dimmed. This indicates that the option does not apply to the current situation or that you may need to make a selection or complete an action before selecting the option.



- **List box** A list of available choices for the command. You can scroll through the list to see additional choices.
- **Text box** A box in which you type information (text or numbers) needed to carry out the command. When a text box is attached to a list box, you can either type a response or select a response from the attached list.
- **Drop-down list** A list of available choices for the command where only one item in the list is displayed. To display the full list, point to the arrow and hold down the mouse button.
- **Option button** One of a group of related options; you can select only one option in a group at a time. When an option is selected, a black dot appears in the small round button.
- **Check box** An option that can be turned on or off. Unlike option buttons, you can turn on as many check boxes as you want, even if they are in a group. When a check box is turned on, an "X" appears in the box.

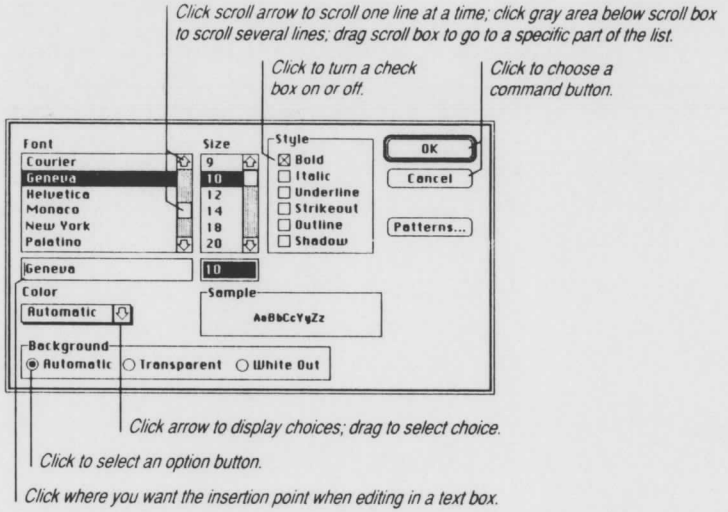
  A check box may appear dimmed if an option is already in effect for some but not all the cells in a selected range. If you want the option to apply to all cells in the selection, turn on the check box. If you want to cancel the option for all cells in the selection, turn off the check box.
- **Command button** A rectangular button labeled with the action it carries out. A bold border indicates that the command button is the default and will be chosen automatically if you press ENTER.

  You choose a command button to carry out the command, cancel the command, or display more options. In most cases, OK is the default button and choosing OK closes the dialog box and carries out the command. In a few cases, the default command button may be labeled with a term such as Open or Find Next. Choosing Cancel closes the dialog box and cancels the command; Microsoft Excel ignores any changes you made in the dialog box.

  Choosing a command button with an ellipsis after the name carries out the command for the currently displayed dialog box and then immediately opens the dialog box for the command labeled on the command button. For example, if you're working in a chart and you choose the Patterns button in the Format Text dialog box, Microsoft Excel accepts the current settings in the Format Text dialog box and opens the Format Patterns dialog box.

Moving and selecting in a dialog box

The following illustration shows how to use the mouse to move around and select options in a dialog box:



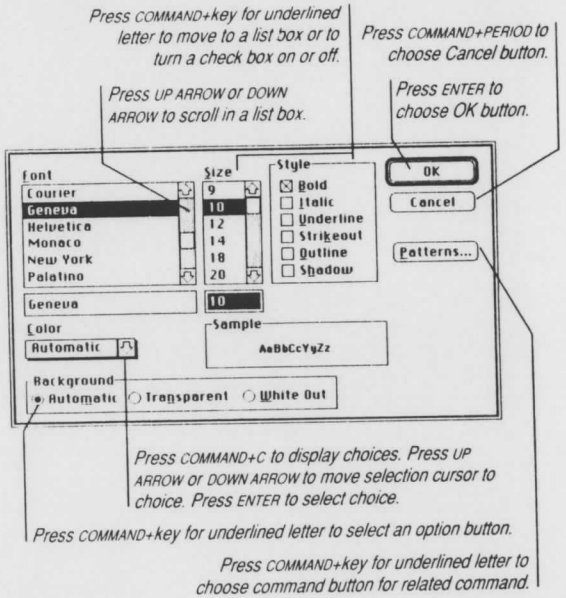
You can also use the following mouse techniques to move and select in a dialog box:

- Double-click a list item or an option button to select the option and carry out the command.
- Click the check box label to turn it on or off, or click the option button label to select it.

The following illustration shows how to use the keyboard to move around and select options in a dialog box.

When the menu bar is activated with the keyboard, Microsoft Excel underlines one letter of each menu, command, and dialog box option. Pressing the key for the underlined letter chooses that menu or command. In dialog boxes, press COMMAND plus the key for the underlined letter to select the option. For more information on displaying command, menu, and dialog box option underlines, see "More About Choosing Commands," later in this section.

To activate the menu bar with the keyboard, press PERIOD on the numeric keypad when Num Lock is off, or press the alternate menu key (assigned to SLASH (/) initially). (When Num Lock is on, the message "NUM" appears in the status bar and pressing PERIOD enters a period. Press SHIFT+NUM LOCK (CLEAR) to turn Num Lock on or off.)



Editing in a text box

Some dialog boxes have text boxes in which you type text or numbers needed to carry out the command. What you type appears to the left of the insertion point, which shifts existing text to the right as you type.

When you want to edit an existing entry in a text box, you must first select the text box. The entire entry in the text box is highlighted and the insertion point appears at the end of the highlighted text. When you start typing, the highlighted text is deleted and replaced with what you type

NOTE To edit multiple lines of text in a scrollable text box, use the procedures and techniques for editing in a regular text box, plus the UP ARROW and DOWN ARROW keys to move between lines. The Formula Note dialog box displays a scrollable text box in which you can type multiple lines of text.

Use the mouse techniques in the following table to select in a text box. To edit in a text box, use the techniques shown in the keyboard procedure.

To	Do this
Move insertion point within text box entry	Click where you want insertion point
Select or extend selection	Drag to extend selection

Use the techniques in the following table to edit in a text box with the keyboard.

To	Press
Move one character left or right; scroll through text that extends beyond border of text box	LEFT ARROW or RIGHT ARROW
Clear character to left of insertion point	DELETE

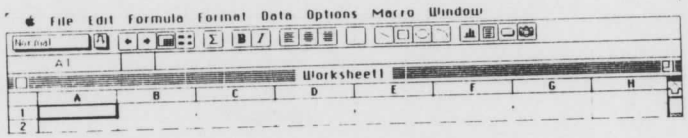
MORE ABOUT

More About Choosing Commands

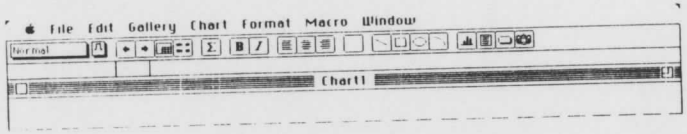
Guideline

Worksheet, Chart, Info, and Null Menu Bars The following illustrations show the names of menus that can appear in the menu bar.

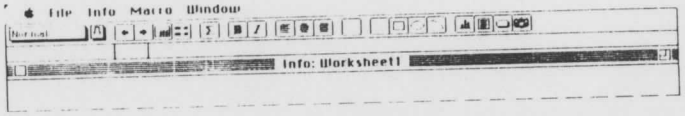
- **Worksheet menu bar** Appears when a worksheet or a macro sheet window is active:



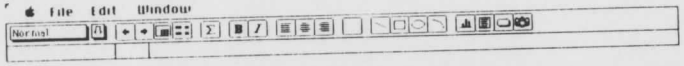
- **Chart menu bar** Appears when a chart window is active:



- **Info menu bar** Appears when the Info window is active:



- **Null menu bar** Appears when no documents are active or open:



Tips

Using the ARROW Keys to Choose Commands You can also use the ARROW keys to select a menu and choose a command after you press PERIOD on the numeric keypad (with Num Lock off) to activate the menu bar. Use the RIGHT ARROW and LEFT ARROW keys to move across the menu bar and press ENTER to open the selected menu. Press the UP ARROW and DOWN ARROW keys to move through a menu and press ENTER to choose a selected command.

MORE ABOUT

Displaying Command and Menu Underlines With the Options Workspace command, you can specify whether the menu and command underlines are always displayed, never displayed, or displayed only when you use the keyboard to choose commands. To select one of these options, choose Options Workspace and, under Command Underline, select On, Off, or Automatic and choose OK. The On option displays the underlines all the time, the Off option turns the underlines off, and the Automatic option displays underlines only when you use the keyboard to activate the menu bar. This setting applies to all your Microsoft Excel sessions until you change the setting.

Moving Around a Dialog Box When Command Underlines Are Not Displayed If the Command Underline option is turned off in the Options Workspace dialog box, you can still use the COMMAND key combinations to move between items in a dialog box. For example, in the Format Fonts (charts) dialog box, you can press COMMAND+P to choose the Patterns command button even though the underlines are not displayed.

You cannot display command underlines in the dialog boxes for the following commands on the File menu: File Open, File Save, File Save As, File Save Workgroup, and File Print. However, you can use the COMMAND key combinations to move between dialog box items.

Specifying an Alternate Menu Key Instead of pressing PERIOD on the numeric keypad (or SLASH (/)) to activate the menu bar, you can assign another key to choose commands with the keyboard. To do this, choose the Options Workspace command and, in the Alternate Menu Key box, type the new key and choose OK. This setting applies to all your Microsoft Excel sessions until you change the setting.

The PERIOD key on the numeric keypad always activates the menu bar when Num Lock is off. (Press SHIFT+NUM LOCK (CLEAR) to turn Num Lock on or off.) "NUM" appears in the status bar if Num Lock is on. If you have an extended keyboard, you can also press F10 to activate the menu bar.

Using Help

Microsoft Excel Help is a complete online reference tool you can use at any time. Help is especially useful when you need information quickly or when your *Microsoft Excel User's Guide* is not available. Help contains a description of each command and dialog box, and explains many procedures for accomplishing common tasks. For example, you can use Help to check the procedure for changing the column width or the keyboard shortcut for a particular command. When you finish reading the Help information, Microsoft Excel displays your worksheet, chart, or macro sheet with everything exactly as you left it.

Microsoft Excel Help provides:

- Information on Microsoft Excel commands, concepts, basic tasks, parts of the screen, and worksheet functions.
- Help on a selected command, an open dialog box, or a message.
- The ability to "jump" to a related topic or definition of a term.
- Microsoft Excel equivalents for Lotus 1-2-3 commands.

You use the various parts of Microsoft Excel Help by selecting topics and choosing buttons in the Help window. Help information is displayed in its own window—you can move and size the Help window just as you would any document window.

For information on	See
Choosing a command	"Choosing Commands" earlier in this chapter
Selecting, moving, and sizing a window	"Working with Windows" later in this chapter
Scrolling through a window	"Selecting Cells and Moving Around the Worksheet" in Chapter 3

Getting Help

When you are working in Microsoft Excel, you can get help any time you want it. Microsoft Excel Help displays different information, depending on what is on your screen when you request help.

- If a command is chosen on a menu or a dialog box is open, the Help window displays information about that command and each option in the dialog box.
- If a message displayed by Microsoft Excel is on the screen, you see a topic about that message. The Help topic helps you decide how to solve the problem that caused the message.
- If you ask for Help at any other time, you see the index of Help topics displayed in the Help window. You can select any topic in the list. The procedure "Jumping to a Related Help Topic," later in this section, explains how to move from topic to topic.

NOTE Microsoft Excel supports Balloon Help if you are using system software version 7.0. If the icon for the Help menu does not appear on the menu bar, you need to switch to the Finder to turn Balloon Help on or off. See your system software version 7.0 documentation for information on using Balloon Help.

Getting help

▶ Press COMMAND+SLASH (/).

If you have an extended keyboard, press HELP.

Getting help on the command or screen element you specify

Another way to choose Help is to use the mouse to specify the command or the part of the window you want help on before opening the Help window.

1 Press COMMAND+QUESTION MARK.

If you have an extended keyboard, press SHIFT+HELP.

The mouse pointer changes to a question mark.

2 Choose the command or click the window feature you want help on.

If you choose a command, you get help on that command instead of carrying it out. If you click a window feature, Microsoft Excel displays the related Help topic.

Getting help on Help

If you forget how to use a Help feature while you are using Help, you can even get help on Help.

1 Choose Window Help.

2 Select Using Microsoft Excel Help either by clicking it with the mouse or by using the ARROW keys to select the topic and then pressing ENTER.

3 Select the topic that you want more information about.

Moving Around in Help

Once you are in Help, there are several ways you can move to other topics to find exactly the information you want, including:

- Jump terms
- Defined terms
- Back button
- Topics button

You can also use the Previous and Next buttons to step through Help topics.

Jumping to a related Help topic

Many topics include *jump terms*. Jump terms are used to go to topics related to the topic in the Help window. Jump terms are underlined with a solid line. When you select a jump term, Help "jumps to" and displays the Help topic for that term. Some topics consist entirely of jump terms.

▶ Double-click the underlined jump term.

1 Press TAB until the jump term is selected.

2 Press ENTER.

Displaying a definition

Many topics also include *defined terms*. Defined terms are underlined with a dotted line. When you display the definition, it appears in a box that overlaps the Help window. The "Definitions" topic contains every defined term used in the Microsoft Excel Help Index.

1 Point to the term you want defined.

2 Hold down the mouse button.

A definition of the term appears on the screen and remains there as long as you hold down the mouse button.

1 Press TAB until the term you want defined is selected.

2 Hold down ENTER.

A definition of the term appears on the screen and remains there as long as you hold down ENTER.

Moving back through Help topics

The Back button in the Help window is used to step back through all the topics you have viewed since opening the Help window.

1 Choose Window Help.

2 Select Using Microsoft Excel Help either by clicking it with the mouse or by using the ARROW keys to select the topic and then pressing ENTER.

3 Select the topic that you want more information about.

Returning to the list of Help topics

If you want to see the list of Help topics, you can return to the index of Help topics.

▶ Click the Topics button.

Returning to Your Work

When you finish using Help, close the window to return to your work.

Exiting Help

▶ Click the close box or the Cancel button in the Help window.

▶ Press COMMAND+PERIOD.

Getting Help on Lotus 1-2-3 Commands

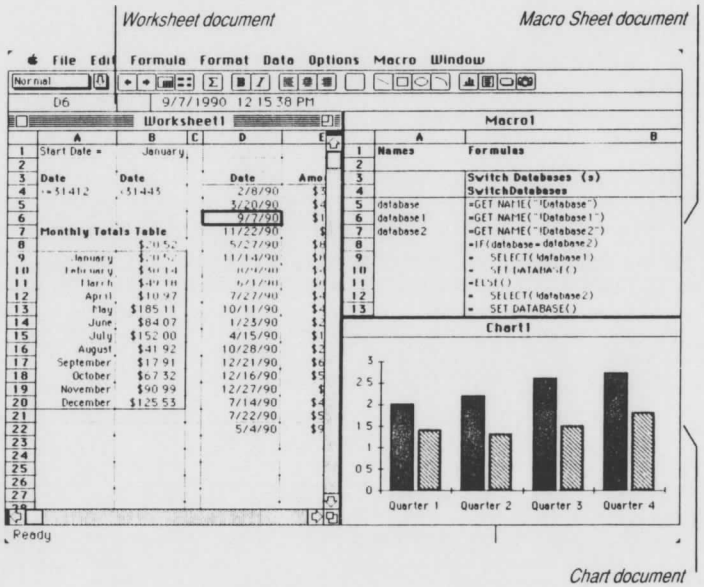
Microsoft Excel Help includes topics for getting help on Lotus 1-2-3. For information on conversion between Lotus 1-2-3 and Microsoft Excel and using the Lotus 1-2-3 Help topic, see Chapter 2, "Using Lotus 1-2-3 with Microsoft Excel."

Working with Windows

In Microsoft Excel, you view a document or work on it in a window. There are three types of Microsoft Excel documents:

- Worksheet
- Chart
- Macro sheet

Each document is displayed in a separate Microsoft Excel window. You can use the mouse to scroll through, switch between, size, move, or close windows as you would in any other Macintosh application.



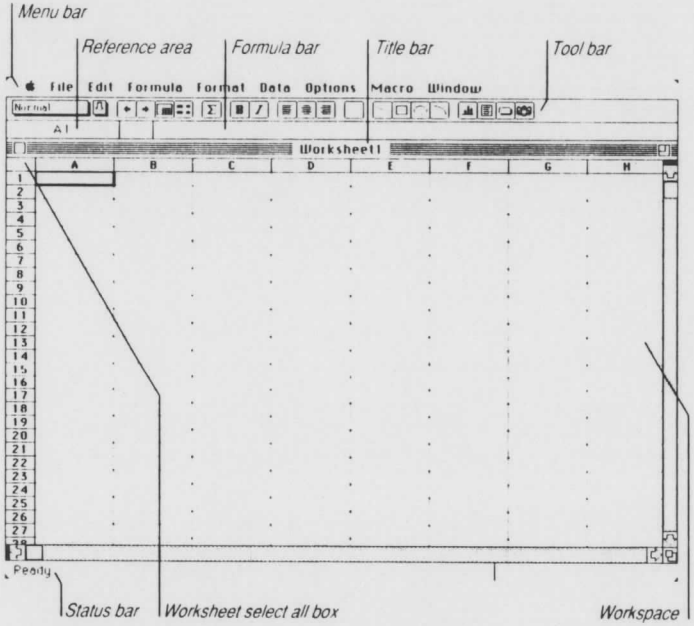
You can open many windows on the screen at one time. However, you can work in only one window at a time. The window in which you are currently working is called the *active window*—the next command or action you perform occurs in this window.

For information on	See
Opening document windows	"Opening an Existing Worksheet" in Chapter 3, "Opening an Existing Chart" in Chapter 12, and "Creating and Opening a Macro Sheet" in Chapter 18
Scrolling through a document window	"Selecting Cells and Moving Around the Worksheet" in Chapter 3
Displaying open windows on your screen	"Changing How Your Worksheet Is Displayed" in Chapter 5
Mouse conventions and mouse pointers	"Before You Begin" at the beginning of this book and "Using the Mouse" later in this chapter
Closing a document window	"Closing a Worksheet Window" in Chapter 3

Online Help also provides information on working with windows. To display online Help, choose the Window Help command. If you are using system software version 7.0 and the Help command does not appear on the Window menu, display Help by pointing to the Help menu icon and choosing the Microsoft Excel Help command. For information on a specific command, select the Commands topic. For information on using online Help, see the previous section, "Using Help."

Understanding Windows

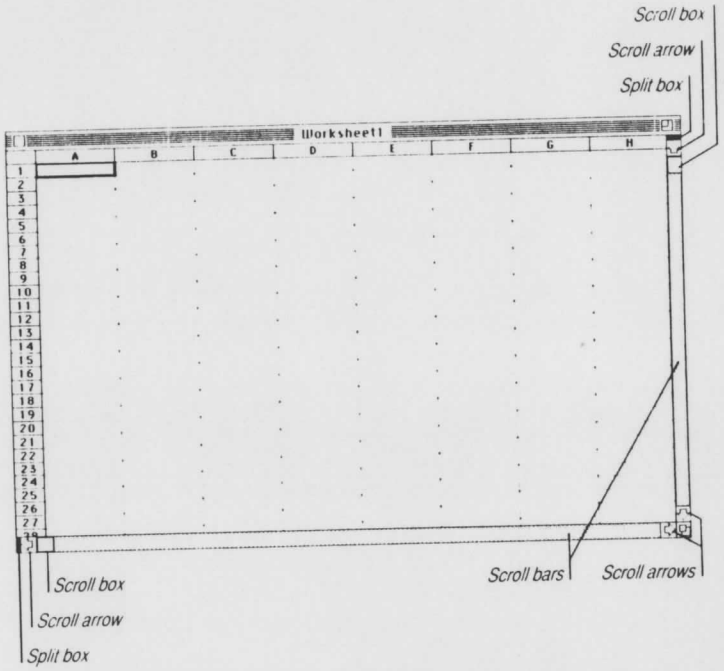
When you start Microsoft Excel, a window for a new worksheet appears. The following illustration shows the parts of a worksheet document window:



- **Title bar** Displays the name of the document.
- **Menu bar** Displays the names of the application menus. In the preceding illustration, you see the menus for worksheets because the active window contains a worksheet.
- **Tool bar** Displays buttons for applying styles to cells; outlining; adding, formatting, and aligning cells; tools for drawing and selecting; creating a chart on a worksheet or macro sheet; and creating a picture of a worksheet or macro sheet. For a description of each button and tool on the tool bar, see "Creating a New Worksheet" in Chapter 3.
- **Reference area** Displays the row and column number of the active cell (A1 in the preceding illustration).

- **Worksheet select all box** Selects all the cells in the worksheet.
- **Formula bar** Displays the contents of the active cell. You enter or edit worksheet data in the formula bar.
- **Workspace** The area in which windows are displayed. You can open more than one window in a workspace.
- **Status bar** Displays brief information about the currently selected command or the current state of the Microsoft Excel workspace.

The following illustration shows the parts of the window you use to move around a document with a mouse:

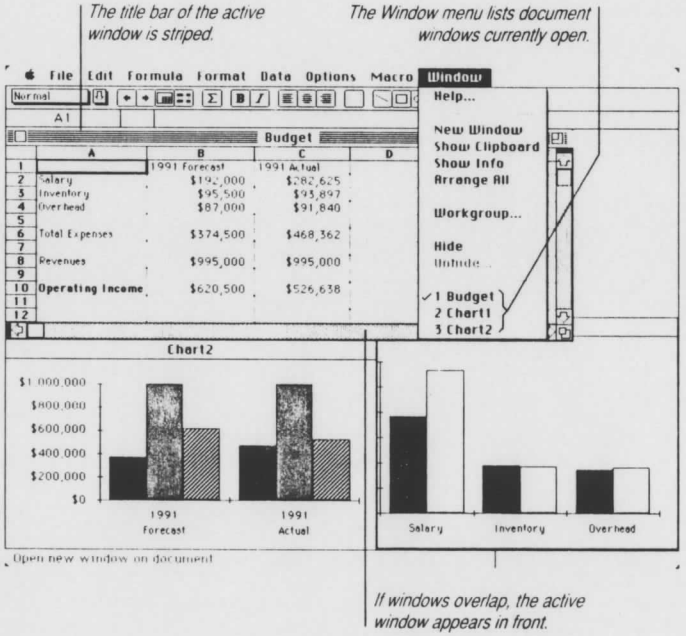


- **Scroll arrows** The arrows at each end of the scroll bar that you click with the mouse to move through your worksheet one row or one column at a time.
- **Scroll boxes** Show the current relative position of the active cell within the worksheet. You can drag this box with the mouse to scroll through your document.

- **Scroll bars** Drag to move through and view a document. You can click in the gray area above or below the vertical scroll box, or to the left or right of the horizontal scroll box, to move through your document one screen at a time.
- **Split boxes** Divide a worksheet window into panes when dragged with the mouse. The small black rectangle at the top of the vertical scroll bar splits a window horizontally; the one at the left of the horizontal scroll bar splits the window vertically.

Activating the Document Window

If you have opened several document windows on the screen, you need to activate the one in which you want to work. The title bar of the active document window is striped as shown in the following illustration. Open windows are listed on the Window menu. You can activate a window by directly clicking it with the mouse, by choosing its title from the Window menu, or by cycling through the open windows with the keyboard.



Activating a visible document window

▶ Click anywhere in the visible portion of the window you want to activate.

If the window you want is not visible, you can use the mouse to manipulate the windows until the one you want is visible. For information on sizing and moving your document windows, see your Macintosh documentation.

You can use the keyboard to activate a document window in two ways. You can press COMMAND+M to cycle through all open windows until the window in which you want to work is active; to activate the previous window, press COMMAND+SHIFT+M.

Or you can select the document you want to activate from the Window menu.

1. Press PERIOD on the numeric keypad (with Num Lock off) or press the alternate menu key (assigned to SLASH (/) initially) to activate the menu bar.
2. Press W to display the Window menu.

   The names of all the document windows currently open are listed in alphabetical order at the bottom of the Window menu. An underlined number precedes each window name.
3. Press the key for the underlined number of the document you want.

If you have more than nine windows open at one time, the Window More Windows command appears at the bottom of the Window menu. To activate an open window that does not appear when you display the Window menu, choose the Window More Windows command, select the document you want in the Activate box, and choose OK.

Activating a document window that is behind other windows

1. Display the Window menu by pointing to the menu name and holding down the mouse button.

   The names of all the document windows currently open are listed in alphabetical order at the bottom of the Window menu. An underlined number precedes each window name.
2. Drag to the document you want to activate.

To activate a document window that is behind other windows with the keyboard, follow the previous keyboard procedure in "Activating a Visible Document Window."

Arranging all windows in the workspace

You can quickly display all the open document windows so that none overlap.

▶ Choose Window Arrange All.

Microsoft Excel rearranges open windows so they use the available workspace most efficiently.

You can also resize and move your document windows using standard mouse techniques. For example, you can drag the title bar to move a window. For information on sizing and moving windows, see your Macintosh documentation.

MORE ABOUT

More About Working with Windows

Guidelines

Info Window Displays information about the active cell on a worksheet or a macro sheet. You can use this window to examine information about the cell, such as its underlying formula, formats assigned to it, references and names associated with it, or cell notes attached to it.

When the Info window is active, Microsoft Excel displays Info window menus. For information on using the Info window, see "Auditing a Worksheet" in Chapter 6.

Window Commands You can use the following Microsoft Excel commands with all types of windows:

- **Window Hide and Window Unhide commands** Use the Window Hide command to hide the active window from view. You may want to use this command when you have worksheets or macro sheets open so you can use their data or macros, but you don't need to see the data or macros and don't want them taking up room on your screen. Use the Window Unhide command to display a hidden document. For information on hiding and displaying windows, see "Setting Up a Workspace" in Chapter 16.
- **Window Arrange All command** Each time you display a new document in a window, it fills the entire screen. Use the Window Arrange All command to view two or more open unhidden documents on the screen at the same time. Microsoft Excel rearranges all open windows so they use the available workspace most efficiently without overlapping borders. For information on displaying your windows, see "Changing How Your Worksheet Is Displayed" in Chapter 5.

MORE ABOUT

In addition, Microsoft Excel has the following window commands and techniques to simplify viewing and analyzing data on a large worksheet or macro sheet:

- **Window New Window command** Use this command when you want to look at different parts of a large worksheet or macro sheet at the same time. For example, you may want to compare the effects of a "what-if" analysis on widely scattered data on a worksheet. With the Window New Window command you can open as many windows as you want into one document; any changes you make in one window are duplicated in all the open windows for that document. For information on opening a new window into a worksheet, see "Changing How Your Worksheet Is Displayed" in Chapter 5.
- **Scrolling through a window** The worksheet and macro sheet windows have scroll bars, which you can use to view all parts of a document that is too large to be displayed in a window at one time. For information on scrolling through a window, see "Selecting Cells and Moving Around the Worksheet" in Chapter 3.
- **Splitting a worksheet window into panes** You can view separate parts of a large worksheet and still scroll them together by splitting a worksheet window into panes. For information on splitting a window, see "Changing How Your Worksheet Is Displayed" in Chapter 5.

Using the Mouse

You may find it easier to use the mouse when you first start learning Microsoft Excel or, if you're an experienced user, when you can't remember the specific keyboard shortcut for a particular command. You can use the mouse or the keyboard to perform the following actions:

- Choose commands and select options in dialog boxes
- Move and select in a worksheet or a chart
- Work with charts and manipulate chart objects

However, you must use the mouse to perform the following actions:

- Select certain buttons and tools from the tool bar
- Size, move, and select graphic objects on your worksheet or macro sheet
- Move and size windows

For information on	See
Command and mouse conventions	"Before You Begin" at the beginning of this book
Keyboard shortcuts for choosing commands and selecting dialog box options directly	"Using Keyboard Shortcuts" later in this chapter
Moving the insertion point and selecting characters in the formula bar with the mouse	"Editing Worksheet Data" in Chapter 3
Selecting cells and moving around on a worksheet with the mouse	"Selecting Cells and Moving Around the Worksheet" in Chapter 3

Mouse Pointer Shapes

In Microsoft Excel, the mouse pointer takes on different shapes, depending on where it is on the screen. The following table shows the pointer shapes you see in various parts of the Microsoft Excel screen and describes the mouse action you use with each pointer shape:

Pointer shape	Screen location	Mouse action
	In menu bar, scroll bars, chart window, and on graphic objects	Use to point and select.
	Inside worksheet	Click to select cell or drag to select range.
	In worksheet or macro sheet after selecting a tool in the tool bar	Drag cross hair to start drawing an object.
	In formula bar and in text box within a dialog box	Click to place insertion point where you want to start editing text or numbers.
	Along the borders between row headings	Drag to adjust row height.
	Along the borders between column headings	Drag to adjust column width.
	At vertical split box	Drag to move split box and divide worksheet window into vertical panes.
	At horizontal split box	Drag to move split box and divide worksheet window into horizontal panes.
	On sample page when previewing pages before printing	Click to select and magnify a portion of the page for closer inspection.

Pointer shape	Screen location	Mouse action
?	Any area of screen when you press COMMAND+QUESTION MARK or SHIFT+F1 for Help	Choose the command or click the area of screen you want help on.
	In Help window on a word underlined by dotted or solid line	Point to the word or phrase with dotted underline and hold down mouse button to see definition; click the word or phrase with solid underline to see related information.
	On a button or object that has a macro assigned to it	Click to run the macro.
	Any area of screen	Wait for the command or action to be carried out.

Using Keyboard Shortcuts

Microsoft Excel has a set of command shortcut keys, special keys, and keyboard techniques. Many of the shortcut keys let you bypass the drop-down menus and carry out commands directly from the keyboard. Other techniques let you move, select, and edit large documents more efficiently. Most of the Microsoft Excel keyboard shortcuts are included in this section. For a complete list of keyboard shortcuts, see the *Microsoft Excel Quick Reference*.

NOTE If you're using Microsoft Excel with an international version of the Macintosh system, some of the keyboard shortcuts may not be available. You can still use the mouse to perform the same actions. This does not affect any other work you do in Microsoft Excel. For information on the system you're using, see your Macintosh system documentation.

For information on	See
Command and keyboard conventions	"Before You Begin" at the beginning of this book
Using keyboard shortcuts in the formula bar	"Editing Worksheet Data" in Chapter 3
Selecting cells and moving around on a worksheet with the keyboard	"Selecting Cells and Moving Around the Worksheet" in Chapter 3

Online Help also provides information on using keyboard shortcuts. To display online Help, choose the Window Help command. If you are using system software version 7.0 and the Help command does not appear on the Window menu, display Help by pointing to the Help menu icon and choosing the Microsoft Excel Help command. For information on a specific command, select the Commands topic. For information on using online Help, see "Using Help," earlier in this chapter.

Understanding Keyboard Shortcuts

Understanding the logic behind keyboard shortcuts can help you learn them more easily. Each shortcut key, editing key, and movement key performs a particular action. You combine those keys with the COMMAND, SHIFT, and OPTION keys to add different meanings to that instruction.

The following list summarizes the general patterns in keyboard shortcuts:

- ENTER and RETURN are used to confirm or carry out an action. In this book, the word ENTER means that you can press either ENTER or RETURN, unless specifically stated otherwise.
- COMMAND is generally used for choosing commands and selecting dialog box options.
- COMMAND+PERIOD is used to cancel an action. If you have an extended keyboard, you can also press ESC.
- TAB, the ARROW keys, and HOME, END, PAGE UP, and PAGE DOWN on the extended keyboard are used primarily for moving, selecting, and scrolling.
- SHIFT usually does one of the following:
  - Extend
  - Perform the opposite action
  - Go in the opposite direction
- OPTION is used in several keyboard shortcuts for applying options in the Format Number and Format Border dialog boxes. In addition, it can be used in combination with the COMMAND key and an alphabetic key to run a macro that you write.
- Function keys on extended keyboards (F1, F2, and so on) are shortcuts for frequently-used commands and actions. If you have a keyboard with 10 function keys, then ALT+F1 is the same as F11, ALT+F2 is the same as F12, and so on.

IMPORTANT Some keyboard shortcuts are available only when you are working with full menus. If you hear a beep when you try one of the shortcuts, check to see if you are working with full menus.

COMMAND and CTRL Key Shortcuts

You can use COMMAND and CTRL key shortcuts to perform the following actions:

- Carry out a command directly without first selecting a menu.
- Carry out a command and select a specific dialog box option directly without first selecting a menu.
- Other actions such as moving items in an outline or selecting items in the tool bar or in a chart. These shortcuts do not have an equivalent menu command.

The following table shows COMMAND and CTRL key shortcuts you can use to bypass menus and carry out commands and, when applicable, select dialog box options directly. The commands are listed in alphabetical order.

In addition, the table lists shortcuts for actions that do not have an equivalent menu command. These actions are also listed in alphabetical order. For example, if you want to find a shortcut for selecting an item on the tool bar, first find "Tool bar" in the list and then look for the item you want to use.

NOTE The key combinations for choosing commands that do not display a dialog box are shown to the right of the menu command name on your screen. A command name followed by an ellipsis (...) on a menu indicates that Microsoft Excel displays a dialog box after you choose that command.

Command (dialog box option) or action	Keyboard shortcut
Chart Navigation—moves through items or between classes of items in a chart	ARROW keys
Chart Select Chart (chart window only)	COMMAND+A
Data Extract	COMMAND+E
Data Find Next	COMMAND+G
Data Find Previous	COMMAND+SHIFT+F
Edit Clear	COMMAND+B
Edit Copy	COMMAND+C
Edit Copy Picture	COMMAND+SHIFT+C
Edit Cut	COMMAND+X
Edit Delete	COMMAND+K
Edit Fill Down	COMMAND+D
Edit Fill Right	COMMAND+R
Edit Insert	COMMAND+I
Edit Paste	COMMAND+V
Edit Paste Special	COMMAND+SHIFT+V
Edit Repeat	COMMAND+Y
Edit Undo	COMMAND+Z

Command (dialog box option) or action	Keyboard shortcut
File New	COMMAND+N
File Open	COMMAND+O
File Print	COMMAND+P
File Quit	COMMAND+Q
File Save	COMMAND+S
File Save As	COMMAND+SHIFT+S
Format Border (Outline)	COMMAND+OPTION+0 (zero)
Format Border (Left)	COMMAND+OPTION+LEFT ARROW
Format Border (Right)	COMMAND+OPTION+RIGHT ARROW
Format Border (Top)	COMMAND+OPTION+UP ARROW
Format Border (Bottom)	COMMAND+OPTION+DOWN ARROW
Format Border—remove all borders	COMMAND+OPTION+- (hyphen)
Format Column Width (Hide)	CTRL+0 (zero)
Format Column Width (Unhide)	CTRL+SHIFT+0 (zero)
Format Font (Bold—toggles between applying and removing bold)	COMMAND+SHIFT+B
Format Font (Italic—toggles between applying and removing italic)	COMMAND+SHIFT+I
Format Font (Outline—toggles between applying and removing outline font)	COMMAND+SHIFT+D
Format Font (Plain text—removes all font styles)	COMMAND+SHIFT+P
Format Font (Shadow—toggles between applying and removing shadow)	COMMAND+SHIFT+W
Format Font (Strikeout—toggles between applying and removing strikeout)	COMMAND+SHIFT+- (hyphen)
Format Font (Underline—toggles between adding and removing underline)	COMMAND+SHIFT+U
Format Number (General format)	COMMAND+OPTION+~
Format Number (#,##0.00 format)	COMMAND+OPTION+!
Format Number (h:mm AM/PM format)	COMMAND+OPTION+@
Format Number (d-mmm-yy format)	COMMAND+OPTION+#
Format Number [$#,##0.00_);($#,##0.00) format]	COMMAND+OPTION+$
Format Number (0% format)	COMMAND+OPTION+%

Command (dialog box option) or action	Keyboard shortcut
Format Number (0.00E+00 format)	COMMAND+OPTION+^
Format Row Height (Hide)	CTRL+9
Format Row Height (Unhide)	CTRL+SHIFT+9
Formula bar—activate	COMMAND+U
Formula bar—text-wrapping while working in the formula bar	COMMAND+OPTION+ENTER
Formula Define Name	COMMAND+L
Formula Find—opens dialog box	COMMAND+J
Formula Find Next	COMMAND+H
Formula Find Previous	COMMAND+SHIFT+H
Formula Goto	COMMAND+G
Formula Note	COMMAND+SHIFT+N
Formula Reference	COMMAND+T
Formula Select Special (Notes)	COMMAND+SHIFT+O (letter o)
Formula Select Special (Current Region)	COMMAND+OPTION+*
Formula Select Special (Row Differences)	COMMAND+\
Formula Select Special (Column Differences)	COMMAND+SHIFT+\
Formula Select Special (Precedents: Direct Only)	COMMAND+[
Formula Select Special (Precedents: All Levels)	COMMAND+SHIFT+[
Formula Select Special (Dependents: Direct Only)	COMMAND+]
Formula Select Special (Dependents: All Levels)	COMMAND+SHIFT+]
Formula Select Special (Visible Cells Only)	COMMAND+SHIFT+Z
Help—activate Help window	COMMAND+/
Help—activate context-sensitive Help	COMMAND+?
Object—selects all objects on a sheet, if an object is selected	COMMAND+A or COMMAND+SHIFT+ SPACEBAR
Options Calculate Document	COMMAND+SHIFT+=
Options Calculate Now	COMMAND+=
Options Display (Formulas—toggles between formulas and values)	COMMAND+` (single left quotation mark)
Options Display (Outline Symbols—toggles between displaying and hiding outline symbols)	COMMAND+8
Options Display (Objects—switches between displaying placeholders for objects, showing all objects, and hiding all objects)	COMMAND+6
Options Workspace (Tool Bar—toggles between displaying and hiding the tool bar)	COMMAND+7

Command (dialog box option) or action	Keyboard shortcut
Outline—demotes a row or column	COMMAND+SHIFT+K
Outline—promotes a row or column	COMMAND+SHIFT+J
Tool bar—activates style box	COMMAND+SHIFT+L
Tool bar—auto-sum button	COMMAND+SHIFT+T
Tool bar—selects visible cells only button	COMMAND+SHIFT+Z
Tool bar—show outline symbols button	COMMAND+8
Window—activates the next open window	COMMAND+M
Window—activates the previous open window	COMMAND+SHIFT+M
Window—closes document window	COMMAND+W
Worksheet—selects entire worksheet except objects, if a cell is selected; selects all objects on a worksheet if an object is selected	COMMAND+A or COMMAND+SHIFT+SPACEBAR

Function Key Shortcuts

The function key shortcuts are convenient alternatives for choosing many of the most often used worksheet, chart, and macro sheet commands directly from the keyboard. Function key shortcuts bypass menus and carry out commands and actions directly from the keyboard or display the dialog boxes for given commands.

NOTE To use the function keys, you must be using an extended keyboard.

Key	Command or action
F1	Edit Undo
SHIFT+F1	Context-sensitive Help
F2	Edit Cut
SHIFT+F2	Formula Note
COMMAND+F2	Window Show Info
F3	Edit Copy
SHIFT+F3	Formula Paste Function
COMMAND+F3	Formula Define Name
COMMAND+SHIFT+F3	Formula Create Names
F4	Edit Paste
COMMAND+F4	File Close (active window)
F5	Formula Goto
SHIFT+F5	Formula Find (find cell with specific contents)
COMMAND+F5	Restore (decrease) window size

Key	Command or action
F6	Next pane
SHIFT+F6	Previous pane
COMMAND+F6	Next document window
COMMAND+SHIFT+F6	Previous document window
F7	Formula Find (find next cell)
SHIFT+F7	Formula Find (find previous cell)
F8	Turn Extend Selection mode on or off; if you are already in Add To Selection mode, changes to Extend Selection mode
SHIFT+F8	Turn Add To Selection mode on or off
F9	Options Calculate Now
SHIFT+F9	Options Calculate Document
F10	Activate menu bar
COMMAND+F10	Toggles between enlarging and shrinking active document window
F11	File New (Chart option)
SHIFT+F11	File New (Worksheet option)
COMMAND+F11	File New (Macro Sheet option)
F12	File Save As
SHIFT+F12	File Save
COMMAND+F12	File Open
COMMAND+SHIFT+F12	File Print

Using Lotus 1-2-3 with Microsoft Excel

Microsoft Excel includes many features designed to help Lotus 1-2-3 users adjust to Microsoft Excel, including helping you find equivalent Microsoft Excel and 1-2-3 commands and procedures. Transferring data between Lotus 1-2-3 and Microsoft Excel is easy. You can open a 1-2-3 worksheet and work on it in Microsoft Excel, and then you can save it as either a 1-2-3 or Microsoft Excel worksheet. You can also save worksheets that you create in Microsoft Excel as 1-2-3 worksheets. Formulas in Microsoft Excel can also refer to cells on 1-2-3 worksheets.

Table of Contents

Some Things You Need to Know ... 37

Performing Common 1-2-3 Tasks in Microsoft Excel ... 42

Moving Worksheets Between 1-2-3 and Microsoft Excel ... 51

Linking 1-2-3 Worksheets and Microsoft Excel Worksheets ... 57

Some Things You Need to Know

Before you start using Microsoft Excel, there are some concepts and terms you need to know. Many of these concepts and terms are just different ways of referring to familiar 1-2-3 items or actions. Others might be new to you, especially if you have never used a Macintosh before.

Before you read this chapter, you should:

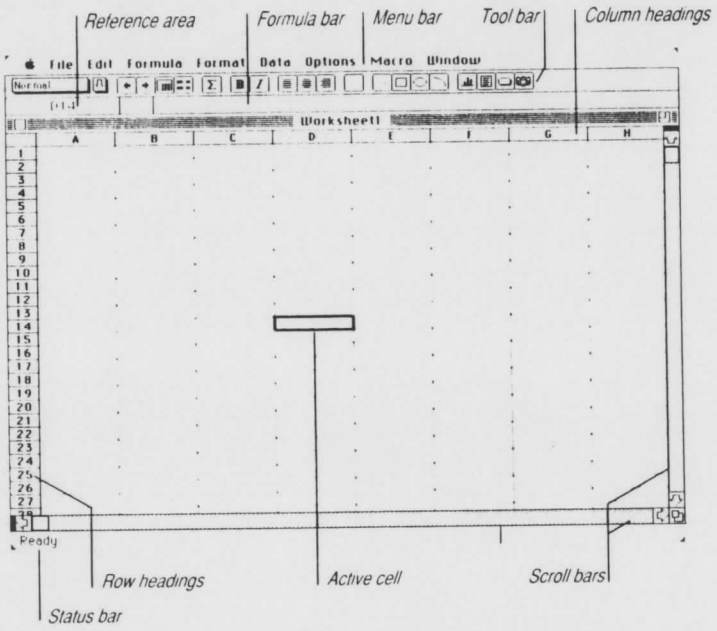
- Install Microsoft Excel by following the directions in Chapter 1 or in *Microsoft Excel Getting Started*.
- Read Chapter 1 of this book and familiarize yourself with using the Microsoft Excel screen, choosing commands and selecting options, and starting online Help.

In this chapter, the keystrokes you can press to choose commands are listed in the procedure steps. For example, (SLASH, O, W) means you press the SLASH (/) key, then O, and then W to choose the command; (COMMAND+O) means that you hold down the COMMAND key and press O to choose the command.

Concepts You Need to Know

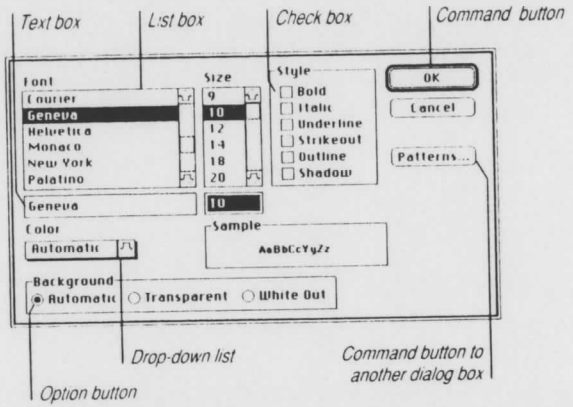
There are a few basic differences between Microsoft Excel and Lotus 1-2-3.

- **The Microsoft Excel screen** The first thing you'll notice is that the Microsoft Excel screen looks different. There is a worksheet with menus at the top of the screen, but there also are many other items on the screen. Many of these you can work with directly, using the mouse or the keyboard to control how your screen looks or what part of the worksheet appears. The following illustration shows parts of the Microsoft Excel screen:



- **Select a range, then a command** In Microsoft Excel, the order in which you perform a task is different than with Lotus 1-2-3. In Lotus 1-2-3, you choose a command and then specify a cell or range the command will affect. In Microsoft Excel, you first select the cell, range, or object you want to work with, and then you choose the command or perform the action you want. This helps your productivity because you can perform a series of commands on the same cell or range. For example, in Microsoft Excel once you select a range, you could format it as bold and left-aligned, increase the column width, and put a border around it, without having to specify a range for each command.

- **Dialog boxes** In 1-2-3 you use multiple menus and fields to select options or settings for a command. When you need to specify options or settings for a command in Microsoft Excel, a *dialog box* is displayed where you can select the command options or settings you want.



After you select the options, you carry out the command by clicking the OK button or by pressing ENTER. Microsoft Excel then carries out the command. If you want to cancel a command, click the Cancel button or press COMMAND+PERIOD.

- **Entering formulas** There are also important differences in how you enter formulas in Microsoft Excel:
  - In Microsoft Excel, you start a formula with an equal sign (=).
  - You can also start a formula with a plus sign (+).
  - Although you are not required to, you can type an @ symbol before Microsoft Excel functions.
  - Microsoft Excel uses a colon (:) to denote a range of cells, instead of the periods (..) used by 1-2-3.

Terms You Need to Know

The following table lists Lotus 1-2-3 terms and their Microsoft Excel counterparts. The Microsoft Excel term is not necessarily an exact equivalent of the 1-2-3 term, but rather a term you'll see in the Table of Contents and Index of this book for information. You don't need to understand all these terms before you start using Microsoft Excel.

Lotus 1-2-3 term	Microsoft Excel term
@Function	Function
Address	Reference
Anchor cell	Selecting a range of cells
Border	Row and column headings
CALC indicator	Status bar
Cell pointer	Active cell
Column labels	Column headings
Command prompt	Dialog box
Control panel	Menu bar, formula bar, status bar
Copy	Copy, then Paste
Crosshatching	Chart patterns
Current cell	Active cell
Current worksheet	Active worksheet, chart, or macro sheet
Cursor	Insertion point
Data labels	Data marker labels
Data range	Data series
Data table 1	One-input table
Data table 2	Two-input table
Data types	Value types
Date format	Number format
Erase	Clear
Formula criteria	Computed criteria
Global	Select entire worksheet
Graph	Chart
Graph labels	Chart text
Graph titles	Chart title
Highlight	Selection

Lotus 1-2-3 term	Microsoft Excel term
Indicator	Status bar
Input range	Database range
Label	Text
Label-prefix	Alignment
Label/matching criteria	Comparison criteria
Logical 0	FALSE
Logical 1	TRUE
Menu pointer	Menu selection
Mode indicator	Status bar
Move	Cut, then Paste
Number/matching criteria	Comparison criteria
Numeric format	Number format
Output range	Extract range
Picture file	Chart document
Pointer movement keys	Movement keys
Print range	Print area
PrintGraph	Printing a chart
Prompt	Dialog box
Protected cell	Locked/protected cell
Range highlight	Selected range
Repeating label	Fill alignment
Retrieve a file	Open a file
Row numbers	Row headings
Stacked bar graph	Column chart, bar chart
Status indicator, status line	Status bar
String	Text
Target cell	Dependent cell
Target file	Dependent document
Time format	Number format
Titles	Split worksheet window with frozen panes
Translate Utility	File Open
Value	Number
Window	Multiple windows, pane

Performing Common 1-2-3 Tasks in Microsoft Excel

This section contains mouse and keyboard procedures for performing common 1-2-3 tasks using Microsoft Excel. Tasks you perform with the mouse have a mouse in front of the first step; tasks performed with the keyboard have a key in front of the first step. The tasks are divided into four command categories:

- Range commands
- Formatting commands
- Printing commands
- File commands

This section also shows how to get help on performing any 1-2-3 command in Microsoft Excel.

Keep in mind that you can choose the Edit Undo command to reverse certain commands or actions immediately after you complete them.

Performing Common 1-2-3 Range Commands in Microsoft Excel

The following procedures show how to copy, move, erase, and name ranges, and how to insert and delete rows and columns. Remember that in Microsoft Excel you select the range you want to work on before you chose a command. For information on moving and copying data and inserting and deleting rows and columns, see Chapter 4, "Editing a Worksheet." For information on naming ranges, see "Naming Cells and Formulas" in Chapter 6.

Moving data (/Move)

1. Click the cell or drag across the range you want to move.
2. Point to the Edit menu and drag down to Cut.

   Microsoft Excel surrounds the cut area with a dotted line called the marquee.
3. Click the cell or drag across the range where you want to move the data.
4. Point to the Edit menu and drag down to Paste.

1. Select the cell or range of data you want to move (SHIFT+ARROW keys).
2. Choose Edit Cut (SLASH, E, T).

   Microsoft Excel surrounds the cut area with a dotted line called the marquee.
3. Select the cell or range where you want to move the data (SHIFT+ARROW keys).
4. Choose Edit Paste (SLASH, E, P).

Copying data (/Copy)

1. Click the cell or drag across the range you want to copy.
2. Point to the Edit menu and drag down to Copy.

   Microsoft Excel surrounds the copy area with a dotted line called the marquee.
3. Click the cell or drag across the range where you want to copy the data.
4. Point to the Edit menu and drag down to Paste.

   Repeat steps 3 and 4 to repeat the copy. Press COMMAND+PERIOD to remove the marquee.

1. Select the cell or range of data you want to copy (SHIFT+ARROW keys).
2. Choose Edit Copy (SLASH, E, C).

   Microsoft Excel surrounds the copy area with a dotted line called the marquee.
3. Select the cell or range where you want to copy the data (SHIFT+ARROW keys).
4. Choose Edit Paste (SLASH, E, P).

   Repeat steps 3 and 4 to repeat the copy. Press COMMAND+PERIOD to remove the marquee.

Inserting a row (/Worksheet Insert Row)

1. Click a cell in the row you want to shift down to open space for the new row.
2. Point to the Edit menu and drag down to Insert.
3. Click the Entire Row option.
4. Click OK.

1. Move the cell pointer to the row you want to shift down to open space for the new row (ARROW keys).
2. Choose Edit Insert (SLASH, E, I).
3. Select the Entire Row option (R key).
4. Press ENTER.

Deleting a row (/Worksheet Delete Row)

1. Click a cell in the row you want to delete.
2. Point to the Edit menu and drag down to Delete.
3. Click the Entire Row option.
4. Click OK.

1. Move the cell pointer to the row you want to delete (ARROW keys).
2. Choose Edit Delete (SLASH, E, D).
3. Select the Entire Row option (R key).
4. Press ENTER.

Inserting a column (/Worksheet Insert Column)

1. Click a cell in the column you want to shift right to open space for the new column.
2. Point to the Edit menu and drag down to Insert.
3. Click the Entire Column option.
4. Click OK.

1. Move the cell pointer to the column you want to shift right to open space for the new column (ARROW keys).
2. Choose Edit Insert (SLASH, E, I).
3. Select the Entire Column option (C key).
4. Press ENTER.

Deleting a column (/Worksheet Delete Column)

1. Click a cell in the column you want to delete.
2. Point to the Edit menu and drag down to Delete.
3. Click the Entire Column option.
4. Click OK.

1. Move the cell pointer to the column you want to delete (ARROW keys).
2. Choose Edit Delete (SLASH, E, D).
3. Select the Entire Column option (C key).
4. Press ENTER.

Changing a column's width (/Worksheet Column Set-Width)

- ▶ Drag the line to the right of the column heading.

1. Move the cell pointer to the column whose width you want to change (ARROW keys).
2. Choose Format Column Width (SLASH, T, C).
3. In the Column Width box, type the column width you want.
4. Press ENTER.

Creating a range name (/Range Name Create)

1. Click the cell or drag across the range you want to name.
2. Point to the Formula menu and drag down to Define Name.
3. In the Name box, type the name you want to assign to the cell or range.
4. Click OK.

1. Select the cell or range you want to name (SHIFT+ARROW keys).
2. Choose Formula Define Name (SLASH, R, D).
3. In the Name box, type the name you want to assign to the cell or range.
4. Press ENTER.

Erasing a range of cells (/Range Erase)

1. Click the cell or drag across the range you want to erase.
2. Point to the Edit menu and drag down to Clear.
3. Click OK.

1. Select the cell or range you want to erase (SHIFT+ARROW keys).
2. Choose Edit Clear (SLASH, E, E).
3. Press ENTER.

Performing Common 1-2-3 Formatting Commands in Microsoft Excel

To format numbers in Microsoft Excel, you use options listed in the Format Number dialog box. For more information on formatting numbers, see "Formatting Worksheet Data" in Chapter 5.

Using comma, percent, or currency formats (/Range Format)

1. Click the cell or drag across the range you want to format.
2. Point to the Format menu and drag down to Number.
3. In the Format Number box, click the format you want. For example, #,##0 for the comma format, 0.00% for the percent format, or $#,##0_);($#,##0) for the currency format.
4. Click OK.

1. Select the cell or range you want to format (SHIFT+ARROW keys).
2. Choose Format Number (SLASH, T, N).
3. In the Format Number box, select the format you want (UP ARROW or DOWN ARROW). For example, #,##0 for the comma format, 0.00% for the percent format, or $#,##0_);($#,###0) for the currency format.
4. Press ENTER.

Performing Common 1-2-3 Printing Commands in Microsoft Excel

In Microsoft Excel, there is no Print or Print Options menu. Instead, you use the File Print command. When you print, Microsoft Excel aligns the printer for you, if necessary. For more information on printing with Microsoft Excel, see Chapter 15, "Printing."

Specifying a print range (/Print Printer Range)

1. Drag across the range you want to print.
2. Point to the Options menu and drag down to Set Print Area.

1. Select the range you want to print (SHIFT+ARROW keys).
2. Choose Options Set Print Area (SLASH, O, A).

Printing a range

1. Specify a print range using the preceding procedure.
2. Point to the File menu and drag down to Print.
3. Click OK.

1. Specify a print range using the preceding procedure.
2. Choose File Print (SLASH, F, P).
3. Press ENTER.

Performing Common 1-2-3 File Commands in Microsoft Excel

Retrieving a file (/File Retrieve)

1. Point to the File menu and drag down to Open.
2. In the list, click the file you want to open.
3. Click OK.

1. Choose File Open (SLASH, F, O).
2. In the list, select the file you want to open (DOWN ARROW).
3. Press ENTER.

Saving a worksheet to a file (/File Save)

1. Point to the File menu and drag down to Save As.
2. In the Save Worksheet As box, type a name for the file.
3. Click OK.

1. Choose File Save As (SLASH, F, A).
2. In the Save Worksheet As box, type a name for the file.
3. Press ENTER.

Creating a graph (/Graph menu)

In Microsoft Excel, graphs are referred to as charts.

1. Drag across the range you want to graph.
2. Point to the File menu and drag down to New.
3. In the New box, click the Chart option.
4. Click OK.

1. Select the range you want to graph (SHIFT+ARROW keys).
2. Choose File New (SLASH, F, N).
3. Select the Chart option (DOWN ARROW).
4. Press ENTER.

Viewing the current graph (/Graph View)

With Microsoft Excel you can have many charts (graphs) associated with a worksheet. When you import a Lotus 1-2-3 worksheet that contains graphs into Microsoft Excel, you can choose to have Microsoft Excel convert the graphs into separate documents. Once you have Microsoft Excel convert the graphs, you can open them like any other document.

1. Point to the File menu and drag down to Open.
2. In the list, click the chart you want to open.
3. Click OK.

1. Choose File Open (SLASH, F, O).
2. In the list, select the chart you want to open (DOWN ARROW).
3. Press ENTER.

Changing the file folder (/File Directory)

1. Point to the File menu and drag down to Open.
2. Double-click the folder name in the list, or point to the folder displayed above the list and drag to select a different folder.
3. Click Cancel to close the dialog box.

Erasing a worksheet file (/File Erase Worksheet)

To do this procedure, you must be using full menus.

1. Point to the File menu and drag down to Delete.
2. In the list, click the file you want to delete.
3. Click OK.
4. Click Yes to confirm deleting the file.
5. Click Close to close the dialog box.

1. Choose File Delete (SLASH, F, D).
2. In the list, select the file you want to delete (DOWN ARROW).
3. Press ENTER.
4. Press ENTER again to confirm deleting the file.
5. Press COMMAND+PERIOD to close the dialog box.

Erasing a worksheet (/Worksheet Erase Yes)

Instead of erasing an existing worksheet, you can simply close the current worksheet and open a new one. However, since you can have multiple worksheets open simultaneously in Microsoft Excel, you do not need to close one worksheet to open another.

1. Point to the File menu and drag down to Close.
2. Point to the File menu and drag down to New.
3. In the New box, click the Worksheet option.
4. Click OK.

1. Choose File Close (SLASH, F, C).
2. Choose File New (SLASH, F, N).
3. In the New box, select the Worksheet option.
4. Press ENTER.

Quitting Microsoft Excel

▶ Point to the File menu and drag down to Quit.

▶ Choose File Quit (COMMAND+Q).

Getting Help on 1-2-3 Commands in Microsoft Excel

Online Help for Microsoft Excel includes a button that tells you how to carry out 1-2-3 commands using Microsoft Excel procedures.

Translating 1-2-3 commands into Microsoft Excel procedures

1. Point to the Window menu and drag down to Help. If you are using system software version 7.0 and a high-resolution monitor, point to the Help menu and drag down to Microsoft Excel Help.
2. Click the Lotus 1-2-3 button.
3. Type the keystrokes for the 1-2-3 command you want to perform in Microsoft Excel.
4. Click OK.

1. Choose Window Help. If you are using system software version 7.0 and the Help command does not appear on the Window menu, display Help by pointing to the Help menu icon and choosing Microsoft Excel Help.
2. Click the Lotus 1-2-3 button.
3. Type the keystrokes for the 1-2-3 command you want to perform in Microsoft Excel.
4. Press ENTER.

You can also select the Switching from Lotus 1-2-3 topic in the Help Index for information on carrying out 1-2-3 commands in Microsoft Excel.

Moving Worksheets Between 1-2-3 and Microsoft Excel

You can use Microsoft Excel with your existing 1-2-3 worksheets. You transfer your 1-2-3 data to Microsoft Excel by opening your 1-2-3 worksheet the same way you open any Microsoft Excel worksheet. This is called *importing*. After you import a 1-2-3 worksheet, you can use all of the Microsoft Excel editing features. When you finish editing the worksheet, you can save it either as a Microsoft Excel worksheet or as a 1-2-3 worksheet.

Similarly, it's easy to save a Microsoft Excel worksheet in a 1-2-3 format, and then open it in 1-2-3. This is called *exporting*. After you export a Microsoft Excel worksheet to 1-2-3, you can edit it using 1-2-3.

Opening a 1-2-3 worksheet in Microsoft Excel

To open your 1-2-3 worksheets, you use the File Open command, just as you do for Microsoft Excel worksheets. Microsoft Excel automatically recognizes the WKS, WK1, and WK3 file formats.

1. Choose File Open (SLASH, F, O).
2. In the list, select the name of the 1-2-3 worksheet you want to open (DOWN ARROW).

   If the 1-2-3 worksheet you want to open is not listed, switch to the folder containing the worksheet by double-clicking the folder name in the list. For more information on working with folders, see "Opening an Existing Worksheet" in Chapter 3.
3. Click Open or press ENTER.

   If the 1-2-3 worksheet you open has graphs associated with it, Microsoft Excel displays a dialog box that asks if you want to create the 1-2-3 graphs as Microsoft Excel charts.
4. To recreate 1-2-3 graphs as Microsoft Excel charts, click OK or press ENTER.

   To open the worksheet without the graphs, click Cancel or press COMMAND+PERIOD.
5. If you receive a message telling you a formula was not imported, click OK or press ENTER. In most cases, Microsoft Excel substitutes the result of a formula for any formula that cannot be imported.

Saving a 1-2-3 worksheet as a Microsoft Excel worksheet

When saving a 1-2-3 worksheet you have edited, change the file format to Normal to save Microsoft Excel-specific formats, settings, or formulas.

IMPORTANT If you do not change the file format, the worksheet is saved in its original 1-2-3 file format and any changes not supported by 1-2-3, such as formatting changes, are lost.

1. Choose File Save As (SLASH, F, A).
2. Choose the Options button (COMMAND+O).
3. In the File Format box, select the Normal option (COMMAND+N).
4. Click OK or press ENTER.
5. In the Save Worksheet As box, type a new name for the file.

   If you want to save the worksheet to a different folder, switch to the folder by double-clicking the folder name in the list. For more information on working with folders, see "Opening an Existing Worksheet" in Chapter 3.
6. Click the Save button or press ENTER.

Exporting a Microsoft Excel worksheet to 1-2-3

To share Microsoft Excel worksheets with 1-2-3 users, save the worksheet in one of the 1-2-3 file formats. You cannot export a Microsoft Excel chart to 1-2-3.

IMPORTANT Any changes you made in Microsoft Excel that are not supported by 1-2-3 are lost.

1. Choose File Save As (SLASH, F, A).
2. Choose the Options button (COMMAND+O).
3. In the File Format box, select the file format you want: WKS, WK1, or WK3 (COMMAND+F, UP ARROW or DOWN ARROW).
4. Click OK or press ENTER.
5. In the Save Worksheet As box, type a new name for the document.
6. Click the Save button or press ENTER.
7. If you receive a message telling you a formula was not exported, click OK or press ENTER. In most cases, Microsoft Excel substitutes the value of the formula in the 1-2-3 file.

MORE ABOUT

More About Moving Worksheets Between 1-2-3 and Microsoft Excel

Guidelines

Importing and Exporting File Formats Microsoft Excel imports and exports the following 1-2-3 file formats:

File format	1-2-3 Release
WKS	1A, Symphony
WK1	2.0, 2.01, 2.2
WK3	3.0

Options That Are Not Exported Options such as panes, titles, and number of windows are not exported from Microsoft Excel. Printing settings such as margins, headers, and footers also are not exported.

Importing and Exporting Formulas Microsoft Excel tries to import and export all formulas. If Microsoft Excel encounters a formula that it cannot import or export, it uses the calculated value of the formula.

Importing and Exporting 3-D Worksheets Microsoft Excel uses linking instead of the 3-D worksheet used in the WK3 file format. Microsoft Excel imports 3-D worksheets to a set of linked worksheets. Microsoft Excel does not export linked worksheets as 3-D worksheets when saving in WK3 format; rather, it exports them as separate, linked worksheets.

Importing Cell Comments In WK3 worksheets, anything following a semicolon in a formula is imported as a cell note in Microsoft Excel.

Importing and Exporting Numbers All numbers are imported to and exported from Microsoft Excel.

Importing and Exporting Labels Any Microsoft Excel formula containing strings is exported to WK1 or WK3 file formats, but not to WKS file format. All strings in 1-2-3 worksheets are imported to Microsoft Excel as text.

Importing and Exporting References Any Microsoft Excel formula involving a reference to multiple selections is not exported. Functions that produce references as a result are not exported to WKS. The Microsoft Excel intersection (space) and union (,) operators are not exported to 1-2-3. In these cases, Microsoft Excel substitutes the value of the formula for the formula itself.

When you save a file in a 1-2-3 file format, any references in a Microsoft Excel worksheet to rows beyond 2,048 (for WKS file format) or 8,192 (for WK1 and WK3 file formats) wrap around the edges of the worksheet. For example, when you save a reference to cell A8193 in WK1 format, the reference changes to A1.

MORE ABOUT

Importing and Exporting External References Lotus 1-2-3 Releases 1A and 2.0 do not support external references to other worksheets, so any Microsoft Excel formulas containing external references are not exported to WKS or WK1 file formats. In these cases, Microsoft Excel substitutes the value of the formula for the formula itself.

Importing and Exporting Logical Values The Microsoft Excel TRUE and FALSE functions change to the 1-2-3 functions @TRUE and @FALSE and vice versa. When you export a Microsoft Excel worksheet to 1-2-3, the logical values TRUE and FALSE evaluate to 1 and 0, respectively.

Importing and Exporting Error Values The Microsoft Excel constant error value #N/A is exported as the 1-2-3 @NA function, and all other constant error values are exported as @ERR. The 1-2-3 function @ERR is imported to Microsoft Excel as #VALUE! and the @NA error function is imported as #N/A.

Importing and Exporting Named Ranges All named ranges are imported to Microsoft Excel. Named constant values and named formulas in Microsoft Excel are not exported to 1-2-3. Rather, formulas that use such names will contain the constant or formula, enclosed in parentheses if necessary.

Importing and Exporting Operators The following table shows the operators used by Microsoft Excel and 1-2-3, in descending order of evaluation:

Lotus 1-2-3 order of operators	Microsoft Excel order of operators
	AND, OR, NOT functions
^	+ or – (unary)
+ or – (unary)	^
* or /	* or /
+ or –	+ or –
= < > <= >= <>	&
#NOT# (unary)	= < > <= >= <>
#AND# #OR#	
& (Release 2.0 or later only)	

In 1-2-3, the exponentiation operator (^) is evaluated before the negation operator (–); in Microsoft Excel, negation is evaluated first. So, the formula =–2^4 produces the value –16 in 1-2-3, and 16 in Microsoft Excel.

Lotus 1-2-3 does not have a union operator (,) or an intersection operator (space). When exporting formulas containing either of these operators, Microsoft Excel substitutes the value of the formula for the formula itself.

Lotus 1-2-3 does not have a percentage (%) operator. A Microsoft Excel expression such as 3% changes to 0.03 in 1-2-3. Lotus 1-2-3 Release 1A does not have a concatenation operator (&).

MORE ABOUT

Importing and Exporting Tables The formulas and values in the top row and left column of a table, as well as the values within the table, are imported to and exported from Microsoft Excel. To calculate the tables after importing, you must specify them as tables again, using the Data Table command.

Lotus 1-2-3 Release 3.0 has three-dimensional tables that contain three-dimensional indexes and lookups. These are not imported to Microsoft Excel.

Importing and Exporting Databases The Microsoft Excel database, criteria, and extract ranges correspond respectively to the 1-2-3 input range, criterion, and output range. All of these ranges are imported and exported.

Microsoft Excel database functions DPRODUCT and DCOUNTA have no equivalents in 1-2-3. Microsoft Excel does not have a function equivalent to the 1-2-3 function @DQUERY. When importing or exporting these functions, Microsoft Excel substitutes the values resulting from the functions for the functions themselves.

There are minor differences in the ways Microsoft Excel and 1-2-3 interpret database criteria. For information on how to specify criteria, see your 1-2-3 documentation and "Using Worksheet Criteria" in Chapter 10 of this book.

Importing and Exporting Number Formats Microsoft Excel imports 1-2-3 number formats according to the following table:

Lotus 1-2-3 format	Microsoft Excel format
+/–	General
Comma, 0 decimals	#,##0
Comma, 2 decimals	#,##0.00
Currency, 0 decimals	$#,##0);($#,##0)
Currency, 2 decimals	$#,##0.00);($#,##0.00)
Date1 (dd-mmm-yy)	d-mmm-yy
Date2 (dd-mmm)	d-mmm
Date3 (mmm-yy)	mmm-yy
Fixed, 0 decimals	0
Fixed, 2 decimals	0.00
Fractions	#?/?
General	General
Hidden (Release 2.0 or later)	; ;
Percent, 0 decimals	0%
Percent, 2 decimals	0.00%
Scientific, 0 decimals	0E+00
Scientific, 2 decimals	0.00E+00
Text	General

MORE ABOUT

For information on number formats, see "Formatting Worksheet Data" in Chapter 5.

Importing and Exporting Alignment Formats Left, Right, Center, and Fill alignments are imported to and exported from Microsoft Excel. The default alignment (Global) in 1-2-3 is not exported. When exported to 1-2-3, all non-text cells are right-aligned.

Importing and Exporting Cell Protection Protected cells in 1-2-3 are protected (locked) in Microsoft Excel and vice versa. Hidden formulas in Microsoft Excel are visible when exported to 1-2-3.

Importing and Exporting Calculation Options In importing and exporting, order of calculation is always made natural.

When importing from 1-2-3 to Microsoft Excel and exporting from Microsoft Excel to 1-2-3, automatic and manual calculation remain unchanged. If calculation is set to Automatic Except Tables, it changes to automatic when exported to 1-2-3.

Exporting Arrays Lotus 1-2-3 does not support arrays. Any exported Microsoft Excel formula involving arrays uses the values in the array instead of the array itself.

Tips

Linking to 1-2-3 Worksheets In addition to being able to change a 1-2-3 worksheet to Microsoft Excel file format, you can link the 1-2-3 worksheet to a Microsoft Excel worksheet and use only those values from the 1-2-3 worksheet that you need. For information on linking to 1-2-3 worksheets, see the following section, "Linking 1-2-3 Worksheets and Microsoft Excel Worksheets."

Consolidating Data from 1-2-3 Worksheets You can consolidate data from 1-2-3 worksheets into Microsoft Excel worksheets. Consolidation combines similar categories of information from several worksheets onto one worksheet. For more information on consolidating data, see "Consolidating Data from Multiple Worksheets" in Chapter 8.

Using 1-2-3 and Microsoft Excel Together If your organization uses both Microsoft Excel and 1-2-3, establish guidelines about how each application and file will be used. Such guidelines help ensure that files used in both applications conform to standards that everyone can understand.

Troubleshooting

Disk is Unreadable If you receive this message, you tried using a non-Macintosh disk. To import files from 1-2-3 into Microsoft Excel, you must transfer files from DOS-format disks to Apple Macintosh-format disks.

Linking 1-2-3 Worksheets and Microsoft Excel Worksheets

You can use values from a 1-2-3 worksheet without exporting it to Microsoft Excel. For example, you can link sales figures from various 1-2-3 worksheets to a single Microsoft Excel worksheet, and then use the formatting and printing features of Microsoft Excel to create a summary report of sales.

Linking 1-2-3 and Microsoft Excel worksheets

To do this procedure, you must be using full menus.

1. In Microsoft Excel, open the 1-2-3 and Microsoft Excel worksheets you want to link.
2. Activate the 1-2-3 worksheet (SLASH, W, number of worksheet).
3. Select the cell or range containing the data you want to link to the Microsoft Excel worksheet (SHIFT+ARROW keys).
4. Choose Edit Copy (SLASH, E, C).

   The dotted marquee appears around the selected cell or range.
5. Activate the Microsoft Excel worksheet (SLASH, W, number of worksheet).
6. Select the cell or the upper-left corner of the range that you want linked to the 1-2-3 worksheet (ARROW keys).
7. Choose Edit Paste Link (SLASH, E, L).

Now, when you change the data in the 1-2-3 worksheet, the Microsoft Excel worksheet is automatically updated. For more information on creating and maintaining links between worksheets, see "Linking Documents" in Chapter 8.

More About Linking 1-2-3 Worksheets and Microsoft Excel Worksheets

MORE ABOUT

Guidelines

Linking to Files from Other Applications You can link Microsoft Excel worksheets to the following types of 1-2-3 files: WKS, WK1, and WK3. You can also link to any files created using another application and saved in one of these 1-2-3 formats.

Linking Without Arrays When you paste a link, Microsoft Excel creates an array formula. To learn how to link worksheets without creating an array formula, see "Linking Documents" in Chapter 8.

Editing Part of an Array You cannot edit a cell that is included in an array range or formula. For information on arrays, see "Creating and Using an Array Formula" in Chapter 7.

When Links Are Updated If you use 1-2-3 to edit a 1-2-3 worksheet linked to a Microsoft Excel worksheet, the linked cells are updated when you open the Microsoft Excel worksheet.

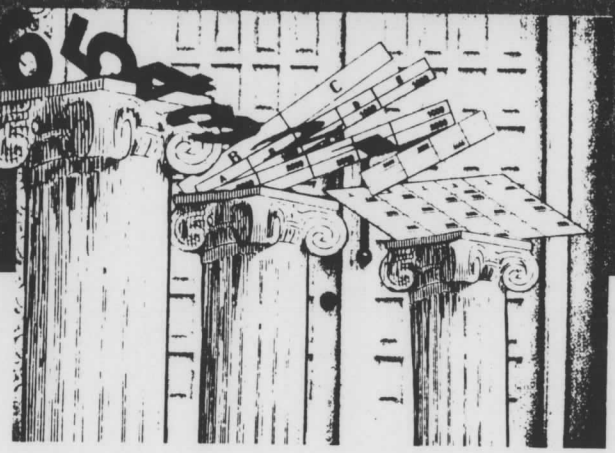
Tips

Consolidating Data from 1-2-3 Worksheets You can consolidate data from 1-2-3 worksheets into Microsoft Excel worksheets. Consolidation combines similar categories of information from several worksheets onto one worksheet. For information on consolidating data, see "Consolidating Data from Multiple Worksheets" in Chapter 8.

Opening Linked Worksheets You can use the File Links command to open worksheets linked to the one you are editing and to change links to a worksheet. For more information on the File Links command, see "Linking Documents" in Chapter 8.

Troubleshooting

Cannot Change Part of an Array If you try to edit one of the cells in a Microsoft Excel worksheet into which you pasted a link from a 1-2-3 worksheet, Microsoft Excel displays a message saying you cannot change part of an array. If you want to change the formula, do so in the 1-2-3 worksheet, and then paste the link again in the Microsoft Excel worksheet. If you want to delete or clear a cell in the area where you pasted a link from a 1-2-3 worksheet, you must delete or clear all the cells that contain the link to the 1-2-3 worksheet. For information on arrays, see "Creating and Using an Array Formula" in Chapter 7.



Worksheets

Part 2 Table of Contents

Chapter 3 Creating and Using a Worksheet ... 61
Creating a new worksheet and opening an existing worksheet. Selecting cells, moving around the worksheet, entering information, building formulas, and using worksheet functions. Saving and deleting a worksheet.

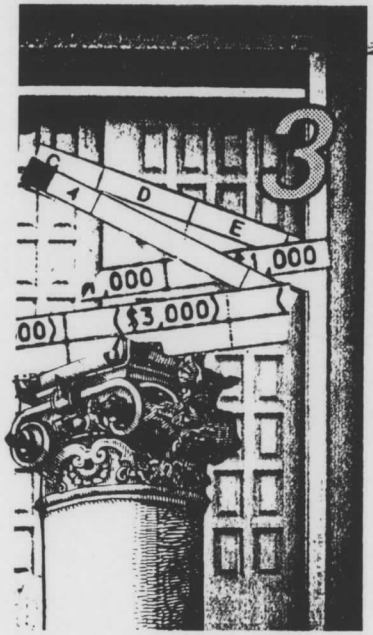
Chapter 4 Editing a Worksheet ... 141
Moving, copying, and clearing data. Inserting rows and columns. Finding and sorting data.

Chapter 5 Formatting a Worksheet ... 175
Formatting and aligning text and numbers. Combining formats and alignments into reusable styles. Changing the on-screen appearance of your worksheet.

Chapter 6 Organizing and Documenting a Worksheet ... 215
Naming, outlining, and adding comments to parts of your worksheet. Checking your worksheet data by using the auditing tools in Microsoft Excel.

Chapter 7 Analyzing and Calculating a Worksheet ... 253
Using data tables, arrays, and goal seeking. Controlling how Microsoft Excel recalculates your worksheets.

Chapter 8 Working with Data from Multiple Documents ... 293
Editing a group of worksheets as a single group to save time. Combining data from multiple documents using linking, embedding, and consolidation. Sharing data with other applications.



Creating and Using a Worksheet

Worksheets are the basis of all your work in Microsoft Excel. You enter data such as text and numbers in worksheet cells and use formulas and functions to produce meaningful values from the data. Worksheets provide the spreadsheet tools you need for projections, calculations, data analysis, decision-making, and reporting.

NOTE Unless otherwise noted, all information and procedures for working with worksheets also apply to macro sheets.

Table of Contents

Creating a New Worksheet ... 61
Opening an Existing Worksheet ... 67
Selecting Cells and Moving Around the Worksheet ... 69
Entering Worksheet Data ... 79
Editing Worksheet Data ... 95
Entering a Formula ... 105
Using Worksheet Functions to Simplify Formulas ... 125
Saving a Worksheet ... 129
Closing a Worksheet Window ... 137
Deleting a Worksheet ... 138

Creating a New Worksheet

In Microsoft Excel, a worksheet, also called a spreadsheet, is the primary document you use to store and manipulate data. Each Microsoft Excel worksheet is a rectangular grid of 256 columns and 16,384 rows. The intersection of each column and row is a cell, the basic unit of a worksheet in which you store data.

You display a worksheet in a worksheet window. You can move and size a worksheet window as you would any other window. This allows you to view one or more worksheet windows in the workspace at the same time. You can also open chart and macro sheet windows as you build or edit a worksheet.

Microsoft Excel includes standard Macintosh window features, such as scroll bars, and the close and zoom boxes. For information on using standard Macintosh window features, see your Macintosh documentation. For information on the types of windows in Microsoft Excel, see "Working with Windows" in Chapter 1.

NOTE Most worksheet procedures and options also apply to macro sheets. A macro sheet is a special kind of worksheet used to create and store macros. For more information on macro sheets, see Chapter 18, "Automating Tasks with Command Macros" and the *Microsoft Excel Function Reference*.

For information on	See
Entering text, numbers, times, and dates	"Entering Worksheet Data" later in this chapter
Entering formulas	"Entering a Formula" later in this chapter
Tips for designing and creating a worksheet that makes the most efficient use of memory	"Saving a Worksheet" later in this chapter
Moving around and scrolling through a worksheet	"Working with Windows" in Chapter 1 and "Selecting Cells and Moving Around the Worksheet" later in this chapter
Opening an existing document window	"Opening an Existing Worksheet" later in this chapter

Online Help also provides information on creating a new worksheet. To display online Help, choose the Window Help command. If you are using system software version 7.0 and the Help command does not appear on the Window menu, display Help by pointing to the Help menu icon and choosing the Microsoft Excel Help command. For information on a specific command, select the Commands topic. For information on using online Help, see "Using Help" in Chapter 1.

Creating a new worksheet

Microsoft Excel automatically creates a new worksheet whenever you start the application. During a work session, you can create additional new worksheets.

1 Choose File New.

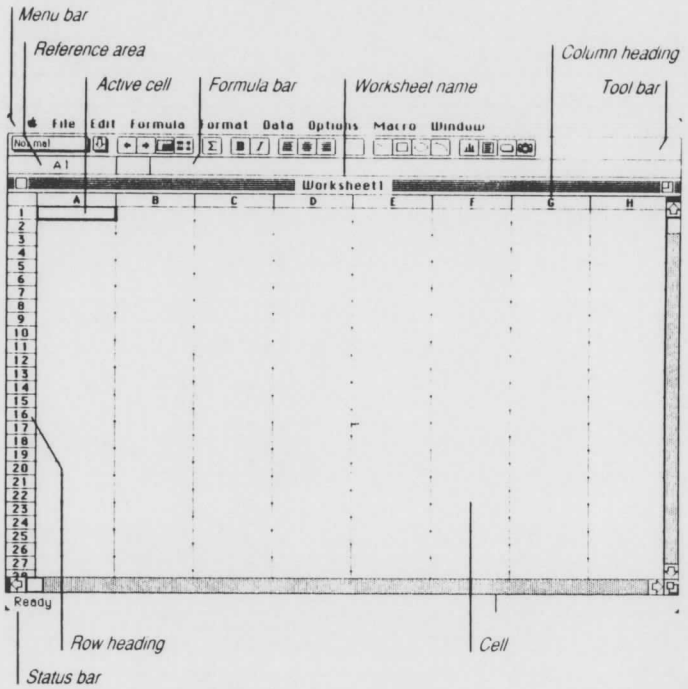
2 In the New box, select the Worksheet option.

3 Choose OK.

Microsoft Excel displays the new worksheet in a new window with its upper-left corner in the upper-left part of the workspace. If a window already occupies that area, Microsoft Excel places the new document window slightly lower and to the right.

The Parts of a Worksheet Window

The following illustration shows the parts of the worksheet window:



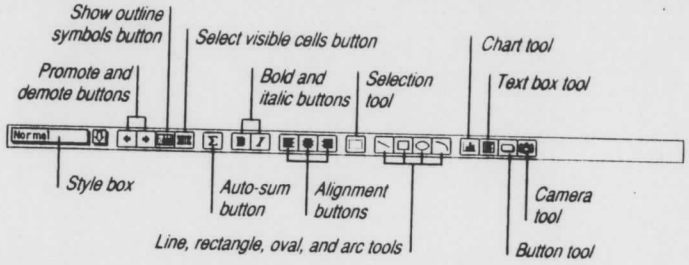
- **Reference area** Displays the row and column number of the active cell. For example, in A1 reference style, the reference D17 designates the cell in column D, row 17. In R1C1 reference style, the same cell would be designated R17C4, the cell in row 17, column 4. If you have selected a graphic object, the reference area displays the object identifier.

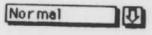
  During certain operations, such as opening or saving a document or sorting a database, the reference area indicates the progress of the operation. Depending on the operation, Microsoft Excel indicates progress in percentage accomplished (such as "Sort: 80%") or in cells remaining to be processed (such as "Recalc: 454"; when recalculation is complete, this number is zero).

- **Formula bar** The part of the Microsoft Excel window you use to enter or edit data or formulas in a worksheet cell. The formula bar displays the constant value or formula contained in the active cell.
- **Menu bar** The bar at the top of the Microsoft Excel window that displays the names of the menus. In the preceding illustration, you see the menus for worksheets because the active window contains a worksheet.
- **Tool bar** The bar below the menu bar that displays buttons for applying styles, creating an outline, selecting all visible cells, automatically calculating the sum of numbers in a cell range, and formatting and aligning cells on a worksheet or macro sheet. The tool bar also contains tools for selecting objects, drawing, creating a chart on a worksheet or a macro sheet, and creating a picture of a worksheet or macro sheet. By selecting a drawing tool, you can create graphic elements on a worksheet or macro sheet, including straight lines, rectangles or squares, ovals or circles, arc segments, text boxes, and buttons. For a brief description of the buttons and tools on the tool bar, see the illustration following this list.
- **Cell** The basic unit of a worksheet in which you can enter and store data. The intersection of every row and every column on a worksheet forms one cell. You can enter a constant value or a formula in a cell. A *constant value* is usually a number (including a date or time) or text, but can also be a logical value or an error value. A *formula* calculates a new value from existing values.
- **Active cell** The cell displayed with a heavy border, which indicates that the cell is *selected*. The next data you type will be entered into this cell or the next command you choose will be applied to this cell. If you select more than one cell, the first cell selected is the active cell; the other cells are highlighted.
- **Column heading** A heading that identifies a column on a worksheet. Column headings are at the top of each column, labeled A through IV (A, B, ... Z; AA, AB, ... AZ; ... IV) in A1 reference style or 1 through 256 in R1C1 reference style.
- **Worksheet name** The name of the worksheet that appears in the title bar of the window. Microsoft Excel initially names each new worksheet Worksheet1, Worksheet2, and so on. You rename each worksheet with a name of your choice when you save it.
- **Row heading** A heading that identifies a row on a worksheet. Row headings are at the left of each row and are labeled 1 through 16384 (in both A1 and R1C1 reference styles).
- **Status bar** A bar across the bottom of the worksheet window that displays brief information about the currently selected command or the current state of the Microsoft Excel workspace.

Normally, Microsoft Excel displays the tool bar, the formula bar, the status bar, and the scroll bars. However, you can hide each of these screen elements. To do this, choose the Options Workspace command and turn off the check boxes for the elements you want to hide. This setting applies to all your Microsoft Excel sessions until you change the setting. To display the screen elements, choose the Options Workspace command and turn on the check boxes for the elements you want to display.

The following illustration shows the buttons and tools that appear on the tool bar:





Style box Use to define and apply formatting styles to a selection. For information on defining and applying styles, see "Formatting with Cell Styles" in Chapter 5.

Promote and demote buttons Use to promote and demote sections of your worksheet to create an outline. For information on outlining, see "Outlining a Worksheet" in Chapter 6.

Show outline symbols button Use to turn the outline symbols on or off. For information on outlining and outline symbols, see "Outlining a Worksheet" in Chapter 6.

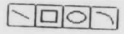
Select visible cells button Use to select all visible cells on your worksheet or macro sheet. The phrase "visible cells" refers to cells whose data you have not hidden. After you have created an outline and hidden the data you don't want to copy or include in a chart, you can select a range, click this button to select the visible cells, and then either copy the visible cells to the Clipboard or create a chart. For more information on outlining and the select visible cells button, see "Outlining a Worksheet" in Chapter 6.

Auto-sum button Use to automatically sum a column or row of numbers. When you select the auto-sum button, Microsoft Excel enters the SUM formula in the active cell. The SUM formula contains a reference to the contiguous range of numbers in the same column above or to the left of the active cell.

Bold and italic buttons Use to turn bold or italic formatting on or off for the data in the selected cells.

Alignment buttons Use to left-align, center, or right-align data in the selected cells.

Selection tool Use to select objects you want to move, size, or format. For more information on working with graphic objects, see "Working with and Formatting Graphic Objects" in Chapter 14.



Line, rectangle, oval, and arc tools Use to create straight lines, rectangles or squares, ovals or circles, and arc segments. To create one of these graphic objects, click the appropriate tool and drag across the worksheet or macro sheet. You can add colors and styles to the graphic object with the Format Patterns command, and you can change the object's size and appearance with the Format Object Placement command.

Chart tool Use to create a chart from the data in the selected cells on your worksheet or macro sheet. For information on creating an embedded chart on your worksheet, see "Creating a New Chart" in Chapter 11.

Text box tool Use to create text boxes on worksheets and macro sheets. You can type an unlimited amount of text directly into a text box. You can format the contents of each text box independently with a variety of fonts, sizes, and styles.

Button tool Use to create a button. You can assign a macro to a button on a worksheet, so the macro runs when you click the button. Although you can assign a macro to any object, you can specify a name to appear in a button. You can add colors and styles to the button with the Format Patterns command, and you can change its size and appearance with the Format Object Placement command. For information on assigning a macro to a button, see "Assigning a Command Macro to a Button or Other Graphic Object" in Chapter 18.

Camera tool Use to take a "picture" of a selected area on a worksheet or macro sheet. Microsoft Excel maintains a link between the selected area and the picture so that any changes you make to the selected area are duplicated in the picture. You can copy these pictures to the Clipboard and then paste them into Microsoft Excel picture charts as data series markers or in other applications as graphics. For information on the camera tool, see "Combining Charts, Worksheets, and Macro Sheets" in Chapter 14.

Opening an Existing Worksheet

To open an existing worksheet, you use the File Open command—the same command that is used to open existing charts, macro sheets, document templates, and workspace files. If the worksheet was one of the last four Microsoft Excel documents used, you can also open the worksheet by choosing the worksheet name from the bottom of the File menu. When you open a worksheet, Microsoft Excel displays it in its own window.

Once you've saved a document with a particular name, use that name whenever you want to open the document. For example, if you want to open a worksheet that you've saved with the name Sales, choose the File Open command and select Sales in the dialog box.

With the File Open command, you can also open a text file that's in a different format. This makes it possible to work in Microsoft Excel with data from other applications. For example, you can open a text file as comma- or tab-delimited or you can specify the source of the data you're using as Macintosh, Windows, DOS, or OS/2. For more information on working with files from other applications, see "Exchanging Documents with Other Applications" in Chapter 8.

For information on	See
Opening an existing chart	"Opening an Existing Chart" in Chapter 12
Opening a macro sheet	"Creating and Opening a Macro Sheet" in Chapter 18
Opening a linked worksheet	Chapter 8, "Working with Data from Multiple Documents"
Opening a document template	"Creating and Using a Document Template" in Chapter 16
Opening a workspace file	"Setting Up a Workspace" in Chapter 16
Opening a document on a network	Appendix C, "Using Microsoft Excel with Networks"
Opening a file in a different format	"Exchanging Documents with Other Applications" in Chapter 8
Saving a document in a different format	"Saving a Worksheet" later in this chapter and "Exchanging Documents with Other Applications" in Chapter 8

Online Help also provides information on opening an existing worksheet. To display online Help, choose the Window Help command. If you are using system software version 7.0 and the Help command does not appear on the Window menu, display Help by pointing to the Help menu icon and choosing the Microsoft Excel Help command. For information on a specific command, select the Commands topic. For information on using online Help, see "Using Help" in Chapter 1.

Opening an existing worksheet

1 Choose File Open.

2 In the list, select the worksheet you want to open.

If the worksheet you want to open is not listed, switch to the folder containing the worksheet by double-clicking the folder name in the list. For more information on changing drives and folders, see "More About Opening an Existing Worksheet," later in this section.

3 Choose the Open button.

Opening a recently opened worksheet

Microsoft Excel displays a list of the four most recently opened files near the bottom of the File menu. The first document listed is the one opened the most recently.

NOTE The list of the four most recently opened files is not displayed on Macintosh computers with 9-inch screens, such as the Macintosh Plus, SE, or SE/30.

▶ Choose one of the documents listed near the bottom of the File menu.

MORE ABOUT

More About Opening an Existing Worksheet

Guidelines

Changing Disk Drives or Folders When you first choose the File Open command, Microsoft Excel displays the name of the current drive in the upper-right corner of the File Open dialog box and the the name of the current folder in a box at the top of the dialog box. The folders and files in the current folder are listed in a box below the name of the current folder. To open a worksheet in a folder in the current folder, double-click the folder name in the list. The folders and files in the folder you double-clicked are then listed in the box. To open a worksheet in a higher-level folder above the current folder, point to the current folder name at the top of the dialog box and drag down to select the folder you want. To open a worksheet in a folder on another drive, choose the Drive button (or the Desktop button, if you are using system software version 7.0).

Opening a Worksheet on a Network If you are using Microsoft Excel on a network, you can let any number of people on the network open the worksheet and view its contents at the same time. If you open a document with the Read Only check box turned on in the File Open dialog box, others using the network can also open the worksheet. For information on protecting data, see "Protecting Documents and Windows" in Chapter 16. For information on using Microsoft Excel documents on a network, see Appendix C, "Using Microsoft Excel with Networks."

MORE ABOUT

Opening a Protected Worksheet If a worksheet was assigned a password when it was saved with the File Save As command, Microsoft Excel does not open the worksheet until you enter the password. For information on using a password to prevent unauthorized users from opening your worksheet, see "Protecting Documents and Windows" in Chapter 16.

Tips

Opening a Worksheet Automatically If you frequently use the same Microsoft Excel worksheet, you can save time by specifying that Microsoft Excel automatically open that worksheet each time you start Microsoft Excel. To do this, see "Specifying a Startup Folder and Document" in Chapter 16.

Opening a Workspace If you often use a group of Microsoft Excel worksheets together, you can save time by saving these documents together as a workspace. To save a workspace, use the File Save Workspace command. To open a workspace, use the File Open command. All documents that were open when you saved the workspace are automatically opened when you open the workspace file.

Selecting Cells and Moving Around the Worksheet

Before carrying out most commands and tasks in Microsoft Excel, you must first select the part of the worksheet you want to work with. A *selection* consists of the highlighted items on your screen that will be affected by the next command or action. A worksheet selection can be a cell, a range of cells, an object, or characters in the formula bar. Microsoft Excel usually highlights what you select on the worksheet—the active cell in the selection is surrounded with a heavy border. Characters you select in the formula bar are also highlighted. However, Microsoft Excel surrounds cells you want to copy with a dotted line, called the *marquee*.

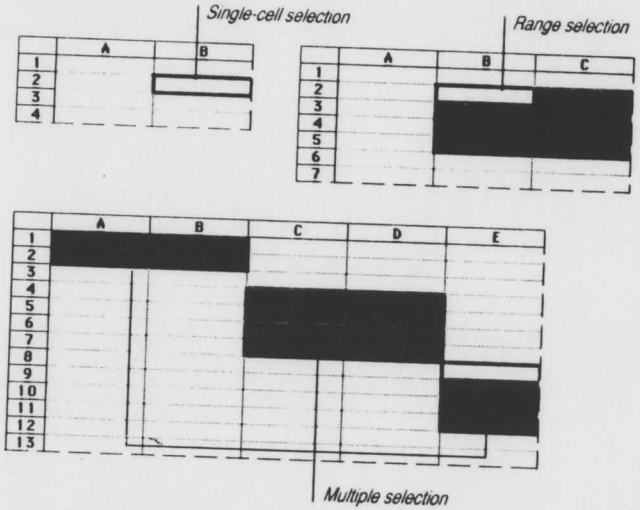
If you're working in a worksheet that is too large to be displayed all at once, you can easily scroll through the worksheet to find the part of the worksheet you want.

For information on	See
Selecting and moving in the formula bar	"Editing Worksheet Data" later in this chapter
Selecting and moving in a chart	"Selecting Items in a Chart" in Chapter 12
Selecting and moving an object	"Working with and Formatting Graphic Objects" in Chapter 14

Online Help also provides information on selecting cells and moving around the worksheet. To display online Help, choose the Window Help command. If you are using system software version 7.0 and the Help command does not appear on the Window menu, display Help by pointing to the Help menu icon and choosing the Microsoft Excel Help command. For information on a specific command, select the Commands topic. For information on using online Help, see "Using Help" in Chapter 1.

Selecting Cells on a Worksheet

You can make three kinds of worksheet selections: a single cell, a range, or a multiple selection. A multiple selection consists of single cells or ranges that are not next to each other. The following illustration shows an example of each type of selection:



After you select a range or make a multiple selection, you can use the mouse or keyboard to move the active cell within the selection while keeping the cells selected. For more information, see "Moving Within a Selection," later in this section. For information on entering data in a selection, see the following section, "Entering Worksheet Data."

NOTE Movement keys include the ARROW keys (UP, DOWN, LEFT, or RIGHT), HOME, END, PAGE UP, and PAGE DOWN and their related key combinations such as SHIFT+HOME.

Selecting a single cell

A selected single cell is called the active cell.

- ▶ Click the cell you want to select.

- ▶ Press the movement keys to move to the cell you want to select.

Selecting a range of cells

You can select any rectangular section of a worksheet. When you select a range, the first cell you select becomes the active cell.

1. Point to the first cell you want to select.
2. Hold down the mouse button and drag through the remaining cells you want to select.

1. Press the movement keys to move to the cell you want to select.
2. Hold down SHIFT and press a movement key to extend the selection to include the cells you want.

Making a multiple selection

You can select any combination of single cells or ranges of cells. The ranges do not have to be adjacent but can be anywhere on the worksheet.

1. Click the first cell, or drag through the first range.
2. Hold down COMMAND as you click each additional cell or drag through each additional range.

To do this procedure, you must be using an extended keyboard.

1. Press the movement keys to move to the first cell in the range you want to select.
2. Hold down SHIFT and press a movement key to extend the selection to include the cells you want.
3. Press SHIFT+F8 to keep the current selection.

   The message "ADD" appears in the right side of the status bar to let you know that you can add another nonadjacent cell or range to the selection.
4. Move to the first cell of the next range you want to select and press SHIFT+F8.
5. Hold down SHIFT and press a movement key to extend the selection to include the cells you want.
6. Press SHIFT+F8 to keep that selection.
7. Repeat steps 4 through 6 to add selections.

Selecting a Specific Cell or Range

The fastest way to find and select another part of a worksheet is to use the Formula Goto command. Formula Goto quickly scrolls through the worksheet and selects a cell, a cell range, or a named area. A named area is a cell or a group of cells that has been assigned a name; once a name is defined, you can use the name instead of cell references to refer to the named cell or cell range. For information on using names, see "Naming Cells and Formulas" in Chapter 6.

Finding and selecting a cell or range

1 Choose Formula Goto.

2 In the Reference box, type a cell or range reference or select a name in the list.

3 Choose OK.

Going back to where you were

Each time you use the Formula Goto command to go to another part of the worksheet, Microsoft Excel remembers your previous location and automatically displays that location in the Reference box the next time you choose the command.

1 To go back to where you were, choose Formula Goto again.

2 Choose OK.

Selecting Cells with Specific Types of Contents

You can select groups of cells with specific types of cell contents. Use the Formula Select Special command to make a multiple selection of all cells in a range or in the entire worksheet that contain any of the following cell contents:

- **Notes** Useful for quickly finding and reading worksheet notes.
- **Constants** Useful for selecting data so you can clear it with the Edit Clear command while retaining formulas.
- **Formulas** Useful for finding formula errors.
- **Blanks** Useful for finding cells that should contain data, but don't, and are therefore causing formulas to produce misleading results.

- **Current region or array** Useful for selecting the region or array to which the active cell belongs.
- **Row or column differences** Useful for finding cells that are different in the same row or column.
- **Precedents or dependents** Useful for tracing how cells are connected in your worksheet, and for building macros that trace references.
- **Last cell** Useful for finding the cell that marks the lower-right corner of the worksheet or macro sheet.
- **Visible cells** Useful for selecting visible cells in an outline. You can also select visible cells using the select visible cells button ( ) in the tool bar.
- **Graphic objects or text boxes or buttons** Useful for finding all graphic objects including all text boxes or all buttons on your worksheet. For information on selecting graphic objects, see "Working with and Formatting Graphic Objects" in Chapter 14.

For more information on and procedures for finding cells with the Formula Select Special command options; finding and replacing data; or on finding specific formulas, values, or any sequence of characters, see "Finding and Replacing Cells and Data" in Chapter 4.

Selecting cells with specific contents

To do this procedure, you must be using full menus.

1 To search the entire worksheet, select a single cell.

To limit the search to a specific range, select the range.

2 Choose Formula Select Special.

3 Select the appropriate option for what you want to select.

4 Choose OK.

Microsoft Excel makes a multiple selection of all cells in the search area with the type of contents you selected in the dialog box. For information on moving through the cells in the selection, see "Moving Within a Selection," later in this section.

Selecting Cells with the Mouse

You can use your mouse to select on a Microsoft Excel worksheet. The mouse performs similar actions in the formula bar. For information on selecting in the formula bar, see "Editing Worksheet Data," later in this chapter.

To select on a worksheet with the mouse, use the actions listed in the following table. When you select a range or make a multiple selection, you can move the active cell within the selection and still keep the cells selected. For information, see "Moving Within a Selection," later in this section.

To	Do this
Select a single cell	Click the cell you want.
Select a range	Drag through the cells you want.
Select an entire row or column	Click the row or column heading.
Select many rows or columns	Drag through the row or column headings.
Select the current array	Hold down COMMAND+SHIFT and double-click any cell in the range.
Select the entire worksheet, except objects	Click the blank rectangle to the left of the column headings.
Make a multiple selection	Drag through the first selection, and then hold down COMMAND as you drag through each additional selection.

Moving and Selecting with the Keyboard

With Microsoft Excel you can use a complete set of keys to move around and select cells on a worksheet. Many keys perform similar actions in the worksheet and in the formula bar. For information on moving and selecting in the formula bar, see "Editing Worksheet Data," later in this chapter.

To move and select in a worksheet with the keyboard, use the keys and key combinations listed in the following table. When you select a range or make a multiple selection, you can move the active cell within the selection and still keep the cells selected. For information, see "Moving Within a Selection," following in this section.

To use the HOME, END, PAGE UP, and PAGE DOWN keys, you must be using an extended keyboard.

To	Press
Move to and select one cell up, down, left, or right	ARROW key (UP, DOWN, LEFT, RIGHT)
Extend selection one cell up, down, left, or right	SHIFT+ARROW key
Move by one block of data up, down, left, or right	COMMAND+ARROW key
Extend selection by one block of data up, down, left, or right	COMMAND+SHIFT+ARROW key
Move to start of row containing active cell	HOME
Extend selection to start of row	SHIFT+HOME
Move to end of row containing active cell (last occupied column of worksheet)	END
Extend selection to end of row (last occupied column of worksheet)	SHIFT+END
Select entire rows containing selected cell or range	SHIFT+SPACEBAR
Select entire columns containing selected cell or range	COMMAND+SPACEBAR
Move to and select active cell at upper-left corner of worksheet	COMMAND+HOME
Extend selection to active cell at upper-left corner of worksheet	COMMAND+SHIFT+HOME
Move to and select active cell at lower-right corner of worksheet	COMMAND+END
Extend selection to active cell at lower-right corner of worksheet	COMMAND+SHIFT+END
Move to and select active cell at upper-left corner of window	HOME (Scroll Lock on)
Extend selection to active cell at upper-left corner of window	SHIFT+HOME (Scroll Lock on)
Move to and select active cell at lower-right corner of window	END (Scroll Lock on)
Extend selection to active cell at lower-right corner of window	SHIFT+END (Scroll Lock on)
Select the entire worksheet except objects, if a cell is selected; select all objects on the worksheet if an object is selected	COMMAND+A or COMMAND+SHIFT+SPACEBAR
Collapse selection to a single cell or object	SHIFT+DELETE

Moving Within a Selection

When you select a range or make a multiple selection, you can move the active cell within the selection and still keep the cells selected. For information on entering data in a range or in a multiple selection, see the following section, "Entering Worksheet Data."

With the mouse, hold down CTRL and click the cell in the selection you want. This cell becomes the active cell.

Use the keys listed in the following table to move the active cell while keeping the cells selected.

To move	Press
Down one cell in the selection	ENTER*
Up one cell in the selection	SHIFT+ENTER*
Right one cell in the selection	TAB**
Left one cell in the selection	SHIFT+TAB**
To next corner of range area	CTRL+PERIOD
To next range in a multiple selection	CTRL+TAB
To previous range in a multiple selection	CTRL+SHIFT+TAB

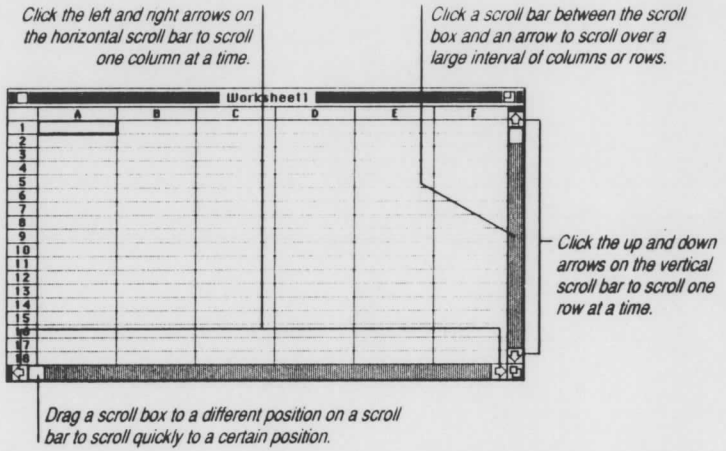
*If selection consists of a single row, then pressing ENTER or SHIFT+ENTER moves the active cell right one cell or left one cell, respectively.

**If selection consists of a single column, then pressing TAB or SHIFT+TAB moves the active cell down one cell or up one cell, respectively.

Scrolling Through a Document

You scroll through a document to see a different part of the document. You can use the scroll bars to move through and view a document that is too large to be displayed all at once in a window. When you scroll through a document, only the screen display changes; the active cell or current selection remains the same.

The entire horizontal or vertical length of a scroll bar represents the entire vertical or horizontal data area of the document. Note that the scroll boxes on the scroll bars move to indicate your position in the document when you scroll.


Click the left and right arrows on the horizontal scroll bar to scroll one column at a time.
Click a scroll bar between the scroll box and an arrow to scroll over a large interval of columns or rows.
Worksheet1
A
B
C
D
E
F
Click the up and down arrows on the vertical scroll bar to scroll one row at a time.
Drag a scroll box to a different position on a scroll bar to scroll quickly to a certain position.

To scroll through the active document with the mouse, use the actions listed in the following table:

To	Do this
Scroll one row or column at a time	Click the arrow at either end of the vertical or horizontal scroll bar.
Scroll one window vertically or horizontally	Click in the scroll bar on either side of the scroll box.
Scroll to a general location	Drag the scroll box to a position in the scroll bar corresponding to the general location you want.

To scroll through the active document with the keyboard, use the key combinations listed in the following table with Scroll Lock turned on. When you turn Scroll Lock on, the message "SCRL" appears in the right side of the status bar. When you are finished scrolling, press SCROLL LOCK again to turn it off so you can use the ARROW keys to select cells.

To use the following table, you must be using an extended keyboard.

To	Turn on Scroll Lock and press
Scroll one row up or down or one column left or right	ARROW key
Scroll up one window	PAGE UP
Scroll down one window	PAGE DOWN
Scroll left one window	COMMAND+PAGE UP
Scroll right one window	COMMAND+PAGE DOWN
Make cell active in upper-left corner of window	HOME
Make cell active in lower-right corner of window	END

MORE ABOUT

More About Selecting Cells and Moving Around the Worksheet

Guidelines

Extending the Selection with the Formula Goto Command If you're using an extended keyboard, you can extend the selection from the active cell to the Goto area by either holding down SHIFT when you choose OK in the Formula Goto dialog box, or by pressing F8 before choosing the Formula Goto command.

Selecting a Named Area or a Reference on Another Worksheet Choose the Formula Goto command and, in the Reference box, type the name of the worksheet, an exclamation point, and the reference or name. For example, to go to B3 on a worksheet named Budget, you would open Budget and type **budget!b3**

Tips

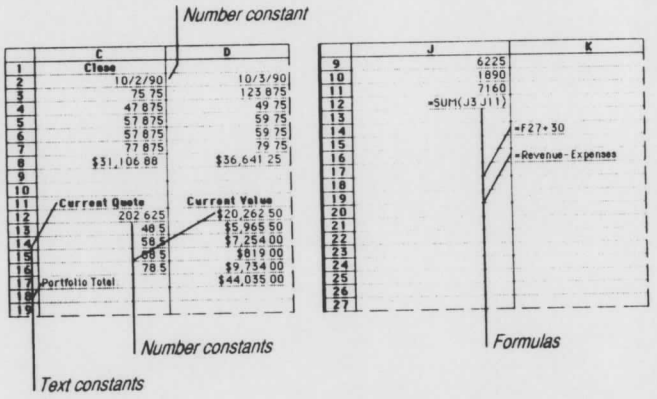
Freezing Titles While You Scroll Through the Worksheet To help you keep track of which columns and rows you're working in while you are scrolling through the worksheet, split the window below the column titles or to the right of the row titles and then choose the Options Freeze Panes command to freeze those titles. The titles for the displayed rows and columns of data will always remain visible. For information on freezing titles, see "Changing How Your Worksheet Is Displayed" in Chapter 5.

Checking the Size of Your Worksheet If you are concerned about how much memory or disk space your worksheet is using, you can check the size of your worksheet by selecting the last cell in the worksheet or macro sheet. The last cell marks the extent of the area of the worksheet that is saved when you save the worksheet; Microsoft Excel ignores the unused rows below and columns to the right of the last cell. To select the last cell, choose the Formula Select Special command and select the Last Cell option.

Entering Worksheet Data

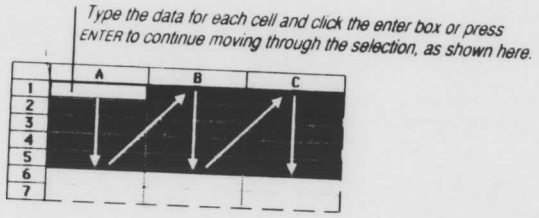
You can enter two basic types of data in a worksheet: constant values and formulas. A *constant value* is data that you type directly into a cell; it can be a numeric value, including a date or time, or it can be text. A *formula* is a sequence of constant values, cell references, names, functions, or operators that produces a new value from existing values. Formulas always begin with an equal sign (=).

Constant values do not change unless you select the cell and edit the value yourself. A value that is produced as the result of a formula can change when other values in the worksheet change. The following illustration shows examples of these types of data in two different worksheets. The worksheet on the right is set up to display formulas in the cells.



In Microsoft Excel, you can enter three basic types of constant values: numbers, dates and times (which are stored as numbers in Microsoft Excel), and text. You use the formula bar to enter values in worksheet cells. For information on entering formulas in worksheet cells, see "Entering a Formula," later in this chapter.

You enter data in a cell by selecting the cell and typing. You can also enter data in a cell range. To enter data quickly into several adjacent cells, first select the range of cells. You can then make cell entries, one after another, in successive cells in the range by pressing ENTER to move to the next cell after you finish typing.



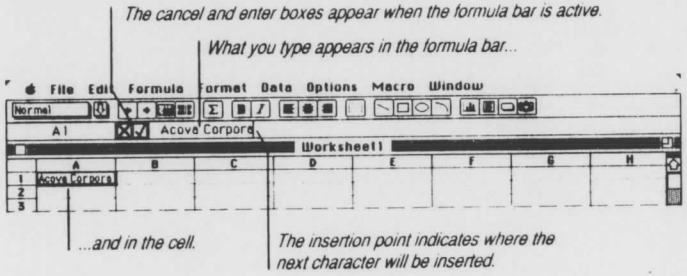
In addition to selecting any rectangular section of a worksheet, you can also make a multiple selection and then enter data into the selected cells. A multiple selection is a selection made up of single cells or ranges that are not next to each other. If you are entering data in different parts of a large worksheet, you can save time by first making a multiple selection. You can then make cell entries, one after another, without first moving to the next cell or cell range. For more information on making a multiple selection and moving the active cell within a multiple selection, see "Selecting Cells and Moving Around the Worksheet," earlier in this chapter.

For information on	See
Selecting with the mouse or keyboard on a worksheet	"Selecting Cells and Moving Around the Worksheet" earlier in this chapter
Editing existing worksheet data	"Editing Worksheet Data" later in this chapter
Entering formulas; inserting cell or range references in a formula	"Entering a Formula" later in this chapter
Using a named cell range or reference in a formula	"Entering a Formula" later in this chapter and "Naming Cells and Formulas" in Chapter 6
Changing how data is displayed in a worksheet	Chapter 5, "Formatting a Worksheet"

Online Help also provides information on entering worksheet data. To display online Help, choose the Window Help command. If you are using system software version 7.0 and the Help command does not appear on the Window menu, display Help by pointing to the Help menu icon and choosing the Microsoft Excel Help command. For information on a specific command, select the Commands topic. For information on using online Help, see "Using Help" in Chapter 1.

Working in the Formula Bar

The formula bar is the part of the Microsoft Excel window below the menu bar where you enter or edit data in a worksheet cell. When you start typing or editing cell data, the formula bar becomes active as shown in the following illustration:



The formula bar displays the constant value or formula contained in the active cell. The *insertion point*, the blinking vertical line in the formula bar, indicates where text will be inserted when you begin typing.

The formula bar includes an *enter box* and a *cancel box*. You complete a cell entry or an edit you've made to an entry by clicking the enter box with the mouse or by pressing ENTER. You cancel an entry or edit by clicking the cancel box with the mouse or by pressing COMMAND+PERIOD.

When a worksheet is active, the reference area displays the reference, or row and column location, of the active cell. While you are selecting a range of cells, this area displays the size of the selected range. For example, if you hold down the mouse button or the SHIFT key and select the range A1:B1, you will see "1RX2C" in the reference area. This tells you that the selected area is 1 row by 2 columns. When you release the mouse button or the SHIFT key, you will see "A1" in the reference area; A1 is the reference of the active cell in the selection.

The formula bar is inactive when the enter and cancel boxes are not displayed—for example, when you first open a new worksheet or when you select cells before choosing a command.

NOTE Most menu commands are unavailable when the formula bar is active. These commands are dimmed to indicate that they are not available until you complete the entry in the formula bar. If you want to work in the worksheet rather than in the formula bar and notice that most commands are dimmed, press ENTER to accept the formula bar entry or press COMMAND+PERIOD to cancel the entry.

Movement keys include the ARROW keys (UP, DOWN, LEFT, or RIGHT), HOME, END, PAGE UP, and PAGE DOWN and their related key combinations such as SHIFT+HOME.

Entering data in a cell

To enter data in a cell, you first select a cell to make it the active cell and then you type the data.

1. Click the cell into which you want to enter data.
2. Type the data.

   The data you type appears in the formula bar and in the active cell.
3. Click the enter box (☑) to enter the data in the cell, or click the cancel box (☒) to clear the data from the formula bar and the cell.

1. Use the movement keys to move to the cell into which you want to enter data.
2. Type the data.

   The data you type appears in the formula bar and in the active cell.
3. Press ENTER to enter data in the cell, or press COMMAND+PERIOD to clear the data from the formula bar and the cell.

Entering data in a cell range

You can quickly enter data into several adjacent cells by selecting a range of cells and then entering the data. In addition to selecting any rectangular section of a worksheet, you can also make a multiple selection and then enter data into the selected cells. This procedure includes steps for entering data in a multiple selection. If you're entering data in a multiple selection, choose the Options Workspace command and turn on the Move Selection After Return check box.

1. Point to the first cell in the range you want to select.
2. Drag through the cell range you want to select.

   To select an additional cell or range on another part of the worksheet (a multiple selection), hold down COMMAND and click each additional cell or drag through each additional range.
3. Type the data for the active cell.

   If you've made a multiple selection and you want to enter data in the first cell range you selected, hold down CTRL while you click the cell in the upper-left corner of the first cell range. This cell becomes the active cell; the data you type appears in this cell.

   The formula bar becomes active when you begin typing.
4. Click the enter box or press ENTER to enter the data and move to the next cell in the selection.

   The next cell in the range is now the active cell.
5. Repeat steps 3 and 4 for the remaining cells in the range.

   If you've made a multiple selection, Microsoft Excel automatically makes the cell in the upper-left corner of the next range the active cell.

To make a multiple selection, you must be using an extended keyboard.

1. Use the movement keys to move to the first cell in the range you want to select.
2. Hold down SHIFT and press a movement key to extend the selection to include the cells you want.

   To select an additional cell or range on another part of the worksheet (a multiple selection), press SHIFT+F8 to keep the current selection. Select the first cell in the next range you want to select and press F8. Use the movement keys to extend the selection to include the cells you want and press SHIFT+F8. Repeat these sequences to add selections.
3. Type the data for the active cell.

   If you've made a multiple selection, use the keys listed in the following table to move to the range you want to enter data in first. The cell you select becomes the active cell; the data you type appears in this cell.

   If you've made a multiple selection and you want to enter data in the first cell range you selected, press CTRL+SHIFT+TAB until you select the cell in the upper-left corner of the first cell range. This cell becomes the active cell; the data you type appears in this cell.

   The formula bar becomes active when you begin typing.
4. Press ENTER to enter the data and move to the next cell in the selection.
5. Repeat steps 3 and 4 for the remaining cells in the range.

   If you've made a multiple selection, Microsoft Excel automatically makes the cell in the upper-left corner of the next range the active cell.

After you make a multiple selection, you can use the keys listed in the following table to move the active cell while keeping the cells selected:

To move	Press
Down one cell in the selection	ENTER*
Up one cell in the selection	SHIFT+ENTER*
Right one cell in the selection	TAB**
Left one cell in the selection	SHIFT+TAB**
To next corner of range area	CTRL+PERIOD
To next range in a multiple selection	CTRL+TAB
To previous range in a multiple selection	CTRL+SHIFT+TAB

*If selection consists of a single row, then pressing ENTER or SHIFT+ENTER moves the active cell right one cell or left one cell, respectively.

**If selection consists of a single column, then pressing TAB or SHIFT+TAB moves the active cell down one cell or up one cell, respectively.

Entering Numbers

To enter a number as a constant, select a cell and type the number. Numbers can include numeric characters (0 1 2 3 4 5 6 7 8 9) and any of the following special characters:

+ - ( ) , / $ % . E e

Microsoft Excel ignores plus signs (+) that come before constant numbers. To enter a negative number, either precede it with a minus sign (-) or enclose it within parentheses [( )]. You can include commas in numbers you enter as constants, such as 1,000,000. Microsoft Excel treats a single period in a numeric entry as a decimal point.

If an entry contains any character other than numbers and the special characters listed earlier, Microsoft Excel interprets it as text. For example, the address "8039 Pacific Avenue" is a text entry. For information on entering text, see "Entering Text," later in this section.

When you create a new worksheet, all cells use the General number format. In General format, Microsoft Excel displays numbers as precisely as possible, using integer format (789), fraction format (7 8/9), decimal fraction format (7.89), or scientific notation (7.89E+08) if the number is longer than the width of the cell. Unless you specify a different format, Microsoft Excel uses General format.

When you type numbers in cells formatted as General, Microsoft Excel assigns the number a built-in format based on what you typed.

If you type	Microsoft Excel assigns this number format
1,000	General
1.0	General
1.1230	General
1.1%	0.00%
1.111%	0.00%
1.1E+2	0.00E+00
1 1/2	# ?/?
1 1/12	# ??/??

For a description of the symbols used in the Microsoft Excel number formats, see "Formatting Worksheet Data" in Chapter 5.

When you enter a number that contains a dollar sign ($) before the number or a percent sign (%) after the number, Microsoft Excel automatically changes the cell's format from General format to dollar format or a percentage, respectively.

You can use the Format Number command to specify a different format for displaying numbers, dates, and times. When you choose Format Number, Microsoft Excel displays a dialog box with a list of built-in number formatting choices. Except for General format, the choices in the list are combinations of symbols that represent what each format looks like. Note that the list also includes date and time formats; these are discussed in "Entering Dates or Times," following in this section.

NOTE Microsoft Excel uses the settings defined in your operating system to determine the default settings for the following items: currency sign, date format, and list separators. For example, if your operating system is configured for Sweden, Microsoft Excel uses "kr" as the currency sign, day-month-year as the date format, and semicolon (;) as the list separator.

The following table lists the built-in number formats and shows examples of each format and what is displayed when the cell contains a positive number, a negative number, and a fraction. For information on the sections (separated by semicolons) in a number format, see "More About Entering Worksheet Data," later in this section.

NOTE The dollar formats produce a trailing space for positive numbers, so that all amounts align on the decimal point regardless of positive or negative values. When entering fractions, do not use numerators greater than 32767 or denominators greater than 9999.

	Number Typed		
Format	**5**	**-5**	**.5**
General	5	-5	0.5
0	5	-5	1
0.00	5.00	-5.00	0.50
#,##0	5	-5	1
#,##0.00	5.00	-5.00	0.50
$#,##0_);($#,##0)	$5	($5)	$1
$#,##0_);[RED]($#,##0)	$5	($5)*	$1
$#,##0.00_);($#,##0.00)	$5.00	($5.00)	$0.50
$#,##0.00_);[RED]($#,##0.00)	$5.00	($5.00)*	$0.50
0%	500%	-500%	50%
0.00%	500.00%	-500.00%	50.00%
0.00E+00	5.00E+00	-5.00E+00	5.00E-01
# ?/?	5	-5	1/2
# ??/??	5	-5	1/2

*Displayed in red

You can also create your own number formats to use in addition to the built-in number formats. For example, if you want to enter social security numbers or telephone numbers, you can reduce data entry time by creating a custom number format that includes the hyphens. You enter just the numbers in the cells, and Microsoft Excel displays the numbers with the hyphens. For a list of the symbols used in Microsoft Excel number formats and procedures for using the symbols to create custom number formats, see "Formatting Worksheet Data" in Chapter 5.

Entering numbers in worksheet cells

1. Select the cell or cell range into which you want to enter a number or a group of numbers.
2. Type the number.

   The number you type appears in the formula bar and in the active cell.
3. Click the enter box or press ENTER.
4. To enter additional numbers in a cell range, repeat steps 2 and 3 for each number.

   Microsoft Excel automatically right-aligns numbers in the worksheet cells.

Assigning a built-in number format

You can assign a built-in number format to cells either before or after the numbers are entered in the cells.

1. Select the cells you want to format.
2. Choose Format Number.
3. In the Format Number box, select a number format.

   If there is a number, date, or time in the active cell when you select a format, Microsoft Excel shows you under Sample how the number, date, or time will look with the selected format.
4. Choose OK.

Entering Dates or Times

In Microsoft Excel, a date or time is a number. Although Microsoft Excel stores the date or time as a number, you can display the date or time in any of several built-in formats by typing the date or time in the format you want or by using the Format Number command to change the format after you enter the date or time. If you use one of the built-in date or time formats when you enter a date or time, Microsoft Excel automatically changes the cell's format from General to the appropriate date or time format. For example, if you type **9-mar-91** in a cell formatted as General (the default format), Microsoft Excel changes the cell's format to the d-mmm-yy date format.

When you choose Format Number, Microsoft Excel displays a dialog box with a list of number formatting choices. The following table lists the built-in date and time formats that appear after the built-in number formats and shows examples of each format:

Format	Display
m/d/yy	3/4/91
d-mmm-yy	4-Mar-91
d-mmm	4-Mar
mmm-yy	Mar-91
h:mm AM/PM	8:50 PM
h:mm:ss AM/PM	8:50:35 PM
h:mm	20:50
h:mm:ss	20:50:35
m/d/yy h:mm	3/4/91 20:50

NOTE Microsoft Excel uses the settings defined in your operating system to determine the default settings for the following items: currency sign, date format, and list separators. For example, if your operating system is configured for Sweden, Microsoft Excel uses "kr" as the currency sign, day-month-year as the date format, and semicolon (;) as the list separator.

You can also type dates and times in formats other than the built-in choices by following these guidelines:

- **Punctuation** You can use a slash (/) or a hyphen (-).
- **Date and time** You can type a date and time in the same cell. You must separate the date and time by a space. For example, you could type either **2/10/91 14:35** or **2:35 pm feb-91** Be sure to include a space between the time and the letters PM.
- **Capitalization** You can type either uppercase or lowercase letters in date and time formats. Microsoft Excel ignores capitalization when you type dates and times.
- **Indicating the 24-hour clock** Unless you type **am** or **pm**, Microsoft Excel automatically displays time using the 24-hour clock (military time).
- **Indicating the 12-hour clock** If you want to display time using the 12-hour clock, type **am** or **pm**. You can also type **a** or **p** instead of **am** or **pm**; you must include a space between the time and the letter.

With Microsoft Excel you can also create and use your own date and time formats. For example, you may want to create a custom format to simplify data entry. You can format a range with a complex custom date or time format, but type the data with a simpler format; Microsoft Excel displays the data in your custom format. For information on creating custom date and time formats, see "Formatting Worksheet Data" in Chapter 5.

Although you can display dates and times in several standard formats, Microsoft Excel stores all dates as serial numbers and all times as decimal fractions. The numbers from 1 to 65380 represent the dates from January 2, 1904, to December 31, 2078—one number for each consecutive day. For example, the serial number for 3/4/91 is 31839.

The decimal fractions from 0.0 to 0.999 represent the times of a day from 00:00:00 (hours:minutes:seconds) or 12:00 A.M. midnight to 23:59:59 or 11:59:59 P.M. For example, the value 0.5 represents 12 noon — 12/24 or 1/2 of a day. The value 0.75 is equal to 6 P.M. — 18/24 or 3/4 of a day. Therefore, 31839.5 represents 12 noon on 3/4/91; the integer number (to the left of the decimal point) represents the date, and the fractional part (to the right of the decimal point) represents the time of the day. You can view a formatted date or time as a serial number by using the Format Number command to change the cell's format to General.

Because Microsoft Excel uses serial numbers, you can easily perform calculations using dates and times as you would other numbers. For example, using normal date formats, you can enter the date you purchase stock in one cell and the date you sell the stock in another cell. In a third cell, you can build a formula with references to these cells to subtract the two dates and find the number of days you held the stock. Because you cannot enter numbers in date or time formats directly in a formula, you enter the date or time as text enclosed in double quotation marks. Microsoft Excel converts it to the corresponding number when calculating the formula. For example, the result of the formula ="12/31/90"-"11/30/90" is 31, the number of days between the two dates. To calculate the formula, Microsoft Excel uses the serial numbers for those dates. You can then display the results in a date format.

Similarly, using normal time formats, you can enter the starting time of an experiment in one cell and the ending time in another cell. In a third cell, you can build a formula to calculate elapsed time. Microsoft Excel uses the decimal fraction equivalents for the times to calculate the formula.

NOTE If the dates in your worksheet are off by four years, use the Options Calculations command to check which date system your computer is using. If the 1904 Date System check box is turned on in the Options Calculations dialog box, serial number 1 represents January 2, 1904. You can change the starting date from which all dates on the worksheet are calculated. For information on the two date systems and how to change them, see "More About Entering Worksheet Data," later in this section.

For information on using formulas, see "Entering a Formula," later in this chapter. Microsoft Excel also has several built-in worksheet functions for manipulating dates, times, and serial numbers. For more information, see the *Microsoft Excel Function Reference*.

Entering a date or a time

1. Select the cell or cell range into which you want to enter a date or a time or a group of dates and times.
2. Type the date or time the way you want it to look.

   The date or time you type appears in the formula bar and in the active cell.
3. Click the enter box or press ENTER.

   Microsoft Excel formats the date or time the way you typed it. You can tell that the date or time is a number because it is right-aligned.

Assigning a built-in date and time format

You can easily assign a different format to a date or a time. You can assign a built-in number format to cells either before or after dates and times are entered in the cells.

1. Select the cells you want to format.
2. Choose Format Number.
3. In the Format Number box, select the date or time format you want.

   If there is a number, date, or time in the active cell when you select a format, Microsoft Excel shows you under Sample how the number, date, or time will look with the selected format.
4. Choose OK.

Entering Text

On a worksheet, *text* is any set of characters entered in a cell that Microsoft Excel does not interpret as a number, formula, date, time, logical value, or error value. As with constant numbers, Microsoft Excel does not change text unless you select the cell containing the text and then edit it.

To enter text as a constant, you select a cell and type the text. Text may contain letters, digits, and other special characters which you can produce on your printer. A cell can hold up to 255 characters of text.

You can also create text entries that include numbers and text or just numbers. If you want to enter an airline flight number, such as "TWA395," you need only type the entry. Because the entry contains nonnumeric characters, Microsoft Excel interprets it as text. However, you may want to enter a number, such as a postal code or a part number, as text. To enter a number as text, you enter the text as a formula and type the numbers within double quotation marks. For example, if you type **="59401"** Microsoft Excel interprets this as the text 59401, not as the number 59401.

You can also enter text in formulas and in charts. In formulas, text includes those characters enclosed in double quotation marks (" "). In charts, the various labels that can be displayed are considered to be text. For information on entering text in formulas and charts, see "Entering a Formula," later in this chapter, and "Adding, Deleting, and Formatting Text" in Chapter 13.

Entering text in worksheet cells

1. Select the cell or cell range into which you want to enter text.
2. Type the text.

   The text you type appears in the formula bar and in the active cell.
3. Click the enter box or press ENTER.
4. To enter additional text in a cell range, repeat steps 2 and 3 for each text item.

   Microsoft Excel automatically left-aligns text in worksheet cells.

MORE ABOUT

More About Entering Worksheet Data

Guidelines

Entering Data in More Than One Worksheet at the Same Time When you are working with similar worksheets, you can save time by selecting these worksheets as a workgroup. The data you enter and the changes you make in the active worksheet are automatically duplicated in the same location in all the sheets in the workgroup. For information on defining a workgroup and a list of Microsoft Excel commands that can be used with a workgroup, see "Editing Worksheets as a Group" in Chapter 8.

Built-in Number Formats In Microsoft Excel, a number format is composed of up to four sections separated by semicolons: three number sections and a text section. You don't have to define all four sections. Instead of three number sections, you can use just one or two, and the text section can be omitted.

If there are three sections, the first section is the format used for a positive number, the second section is the format used for a negative number, and the third section is the format used for zeros. If there are two sections, the first one is used for positive numbers and zeros, and the second one for negative numbers. If there is only one section, that format applies to all numbers. For a description of the symbols used in the Microsoft Excel number formats, see "Formatting Worksheet Data" in Chapter 5.

MORE ABOUT

Values Stored vs. Values Displayed and Calculation Microsoft Excel displays a number according to the format of the cell containing it, so the number you see in a cell may differ from the number Microsoft Excel stores. For example, if a cell is formatted to display only two decimal places and you type **26.006** in that cell, Microsoft Excel displays 26.01. In calculations, however, Microsoft Excel uses the number stored in the cell no matter how it is displayed on the screen. Microsoft Excel stores numbers with 15 digits of accuracy. This is called *full precision*.

If you want Microsoft Excel to calculate on the basis of displayed values only, choose the Options Calculation command and turn on the Precision As Displayed check box.

Entering a Number in a Formula To include a number in a formula, just type the number. In a formula, you cannot use parentheses to indicate a negative number, a comma to separate thousands, or a dollar sign ($) before the number. If you type a percent sign (%) after a number, Microsoft Excel interprets it as the percentage operator and stores it as part of the formula. The % operator acts on the preceding number when the formula is calculated.

Text-Wrapping in a Cell Instead of overflowing long strings of text into adjacent cells, you can display the text on multiple lines within a cell—this is called *text-wrapping*. To select cell text-wrapping, choose the Format Alignment command and turn on the Wrap Text check box. If you turned on the Standard Height text box in the Format Row Height command, Microsoft Excel increases the row height to fit the text in all the wrap-aligned cells in that row. If you set the row height to a specific value, Microsoft Excel displays as many lines of text that fit in that row height. You can center, left-align, or right-align wrapped text in a cell.

Date Systems in Microsoft Excel Dates are stored internally as serial numbers. In Microsoft Excel for OS/2 or Windows, the serial number 1 represents January 1, 1900. In Microsoft Excel for the Macintosh, the serial number 1 represents January 2, 1904. If you are creating a worksheet in Microsoft Excel for OS/2 or Windows and plan to use that worksheet in Microsoft Excel for the Macintosh version 1.5 or earlier, enter all dates under the 1904 date system or the dates will not be displayed correctly on the Macintosh.

If you create a file in Microsoft Excel for the Macintosh using the 1904 date system and then open it under OS/2 or Windows, Microsoft Excel recognizes the file format and changes to the 1904 date system for you. Similarly, if you create a file in Microsoft Excel for OS/2 or Windows using the 1900 date system and then open it on the Macintosh, Microsoft Excel recognizes the file format and changes to the 1900 date system for you.

If the dates in your worksheet are off by four years, you can change the starting date from which all dates on the worksheet are calculated. Choose the Options Calculation command and turn on the 1904 Date System check box to switch to the 1904 date system; turn off the check box to switch to the 1900 date system.

MORE ABOUT

Entering Logical Values and Error Values as Constants Generally, you would not enter logical or error values as data in your worksheet. Logical values and error values are normally displayed as the result of a formula, and therefore are not constants. However, if the values themselves are entered into cells instead of formulas—for example, if you choose the Edit Paste Special command and paste values only—the values are then constants.

Usually, logical values result from formulas that contain a logical function, or an equation that is either true or false, such as =1>0. The valid logical values are TRUE and FALSE. Microsoft Excel displays an error value in a cell when it cannot calculate the formula for that cell. Error values always begin with the number sign (#). The valid error values are: #N/A, #VALUE!, #REF!, #NULL!, #DIV/0!, #NUM!, and #NAME?.

You may want to enter an error value as a constant value when you are entering worksheet data that is not complete. For example, you can type **#n/a** in all the cells for which you currently do not have data; the error value acts as a placeholder and reminds you that data is missing.

To enter a logical or error value as a constant or as part of a formula, just type the value. You can type a logical or error value in either uppercase or lowercase; Microsoft Excel converts the word to all capital letters. For information on using logical values in functions, see the *Microsoft Excel Function Reference*. For information on error values that result from using formulas and how to resolve them, see "Entering a Formula," later in this chapter.

Tips

Checking How Microsoft Excel Interprets the Data You Enter In some cases, such as in calculating a formula or sorting data on a worksheet or in a database, Microsoft Excel makes a distinction between a numeric and a text entry. For example, when sorting numbers in a database, Microsoft Excel sorts the numbers entered as numeric values before sorting the numbers entered as text values. You can quickly check if Microsoft Excel is treating a cell entry as a number or text by looking at how the number is displayed in the cell. Unless you have used the Format Number command to change the cell display, cells use the default General format where numbers are always right-aligned and text is left-aligned.

Entering Fractions That Don't Have Integers If you are entering fractions that don't have integers such as 1/3 or 11/50 in cells with the General format, you must type a zero and a leading space so that Microsoft Excel doesn't convert the fraction to a date. For example, when you type **0 1/3**, the leading zero acts as a placeholder for an integer.

MORE ABOUT

Creating a Date Series When you create your worksheet, you can use the Data Series command to create a series of column or row titles based on incremental time periods such as the months of a year. When you create a date series, you can specify that Microsoft Excel build the series based on increments of days of the month, months, or years. For example, if you start a series with a date and specify increments of months, Microsoft Excel creates a series based on months of the year as column or row titles. For information on creating a series, see "Creating a Series of Dates or Numbers" in Chapter 7.

Troubleshooting

Entries That Exceed Column Width If a number value is too long to be displayed in a cell that has the General format (the default), Microsoft Excel stores the value as you enter it, but displays the number in scientific notation. For example, 250,000,000,000 would be displayed as 2.5E+11. If the number in exponential notation is still too long, or if the cell has any format other than General and is too long to fit, Microsoft Excel displays a series of number signs (####) in the cell. If the cell has a number format other than General and you widen the column enough to accommodate the width of the number, Microsoft Excel displays the number in the cell's format. If a logical or error value exceeds the column width of the cell, Microsoft Excel stores the value, but displays a series of number signs in the cell.

If text is too long to fit in a cell, Microsoft Excel stores the text as you enter it and overlaps the display of the text into the cells to the right until it encounters a cell that is not empty. Microsoft Excel continues to store all of the text that was entered regardless of how much text is displayed.

You can adjust column widths to display long entries. To change column width:

- Point to the vertical line of the column heading and drag to the right to widen the column, or to the left to narrow it.
- Select the column you want to change and choose the Format Column Width command. Choose the Best Fit button, or type a column width in the Column Width box and choose OK. Choosing the Best Fit button automatically adjusts the column width to accommodate the longest cell entry displayed in the selected cells in the column. To quickly adjust the column width to the best fit for the longest cell entry in the column, double-click the line to the right of the column heading.

Troubleshooting Fractions You Type If the fraction you typed in a cell with the General format is changed into a date by Microsoft Excel (for example, "1/9" appears as "9-Jan"), make sure that you enter a zero and a leading space before typing the fraction.

MORE ABOUT

Troubleshooting Date and Time Formats You Type When you type dates and times in formats other than the built-in choices, Microsoft Excel displays a date or time format as close as possible to what you typed. However, in some cases, it may interpret your formats slightly differently than you intended. Use the following troubleshooting information if you're unsure about how Microsoft Excel is interpreting your date or time formats.

NOTE The formula bar shows how Microsoft Excel interprets a date or time format you have typed. Check the cell entry in the formula bar if you have questions about the formatting.

- **Month name and single or double digit** Microsoft Excel interprets a month name followed by a single or double digit to be a month and a year. For example, if you type **february 4 23:45**, Microsoft Excel interprets it as 2/1/04 23:45, not February 4 23:45. If you type **feb-10 17:30**, Microsoft Excel interprets it as 2/1/10 17:30.
- **Entering dates in previously formatted cells** If you enter a date in a cell with neither the General format nor a date format, Microsoft Excel converts the date to a serial number and displays the serial number in the cell's format. For example, if you type **10-feb-91** into a cell formatted to display dollar values, Microsoft Excel stores the serial number for the date, 31817, and displays it as $31,817. To display the number as a date, choose the Format Number command and select the date format you want.
- **Typing times in previously formatted cells** If you type a time in a cell with neither the General format nor a time format, Microsoft Excel converts the time to a decimal fraction and displays the value in the cell's format. For example, if you type **6:00 pm** in a cell formatted to display dollar values without decimals, Microsoft Excel stores the decimal fraction for the time, .75, and displays it as $1 (0.75 rounded off to 1). To correctly display the number as a time, choose the Format Number command and select the time format you want.
- **Date formats Microsoft Excel does not recognize** If Microsoft Excel does not recognize a date format you type, it stores the date as text instead of as a serial number. If you try to use the date in calculations that expect a number, Microsoft Excel returns the #VALUE! error value. For this reason, you should either use a built-in format or create a custom date format when using dates in calculations.
- **Time formats Microsoft Excel does not recognize** If Microsoft Excel does not recognize a time format you type, it stores the time as text instead of as a decimal fraction. If you try to use the time in calculations, Microsoft Excel returns the #VALUE! error value. For this reason, you should either use a built-in format or create a custom time format when using times in calculations.
- **Nonexistent dates** If you enter a date that does not exist, such as 3/40/91, Microsoft Excel interprets it as text. If you try to use the date in calculations that expect a number, Microsoft Excel returns the #VALUE! error value.

Editing Worksheet Data

You can easily change a cell entry in your worksheet by typing a new entry over an existing one or by editing part of the cell entry. If you want to edit only part of the existing cell entry, you can activate the formula bar and use certain keys to move and select in the formula bar and certain commands to edit the cell entry.

For information on	See
Entering numbers, dates, times, and text	"Entering Worksheet Data" earlier in this chapter
Selecting with the mouse or keyboard in a worksheet	"Selecting Cells and Moving Around the Worksheet" earlier in this chapter
Entering formulas; inserting cell or range references in a formula	"Entering a Formula" later in this chapter
Changing how data is displayed in a worksheet	Chapter 5, "Formatting a Worksheet"
Editing data in a chart	"Adding, Editing, and Deleting Chart Data" in Chapter 12

Online Help also provides information on editing worksheet data. To display online Help, choose the Window Help command. If you are using system software version 7.0 and the Help command does not appear on the Window menu, display Help by pointing to the Help menu icon and choosing the Microsoft Excel Help command. For information on a specific command, select the Commands topic. For information on using online Help, see "Using Help" in Chapter 1.

Moving and Selecting in the Formula Bar

To help you edit cell entries quickly and efficiently, you can move the insertion point and select characters in the formula bar with the mouse or the keyboard.

Before you can move and select in the formula bar with either the mouse or the keyboard, you must make sure that the message "Edit" appears in the status bar. This tells you that Microsoft Excel is in Edit mode and the formula bar is active—you can see the enter and cancel boxes.

There are four modes in Microsoft Excel for entering and editing data: Ready, Enter, Point, and Edit. You can use Microsoft Excel without learning about these modes; however, by understanding them you can use the Microsoft Excel data entry and editing features more easily and effectively. For a description of the modes in Microsoft Excel and how to move among them, see "More About Editing Worksheet Data," later in this section.

If you use the keyboard to position the insertion point or select characters in the formula bar or on the worksheet, the keys operate on worksheet cells or on formula bar characters, depending on the current mode. If Microsoft Excel is in either Ready, Enter, or Point modes, the keys operate on worksheet cells.

Moving and selecting in the formula bar

To move and select in a formula bar with the mouse, use the actions listed in the following table:

To	Do this
Position the insertion point in the formula bar	Point and click
Select characters in the formula bar	Drag through the characters you want to select
Select a word in the formula bar	Double-click the word you want

To move and select in a formula bar with the keyboard, use the actions listed in the following table. Make sure that the message "Edit" appears in the status bar. If the status bar displays "Ready," "Enter," or "Point," press COMMAND+U to turn on Edit mode.

To use the HOME, END, PAGE UP, and PAGE DOWN keys, you must be using an extended keyboard.

To	Press
Move one character up, down, left, or right	ARROW key (UP, DOWN, LEFT, RIGHT)
Extend selection one character (LEFT/RIGHT keys) or one line (UP/DOWN keys) if formula bar entry exceeds one line	SHIFT+ARROW key
Move one word up, down, left, or right	COMMAND+ARROW key
Extend selection one word (LEFT/RIGHT keys) or one line (UP/DOWN keys) if formula bar entry exceeds one line	COMMAND+SHIFT+ARROW key
Move to start of line	HOME
Extend selection to start of line	SHIFT+HOME
Move to start of formula bar data	COMMAND+HOME
Extend selection to start of formula bar data	COMMAND+SHIFT+HOME
Move to end of line	END
Extend selection to end of line	SHIFT+END
Move to end of formula bar data	COMMAND+END
Extend selection to end of formula bar data	COMMAND+SHIFT+END

Editing Cell Entries

You can change a value or a formula in your worksheet by editing the data in the formula bar. You can edit a cell entry by choosing one of the editing commands from the following list. When you move or copy characters in the formula bar, Microsoft Excel uses the Clipboard to temporarily store the selected characters before you paste them into their new location. This section assumes you are familiar with Clipboard operations. For information on using the Clipboard, see your system documentation.

- **Edit Cut** Use this command to remove the selected characters from the cell entry and place them on the Clipboard, replacing the Clipboard's contents. After you cut a selection, you can use the Edit Paste command to paste it in the formula bar at the insertion point.
- **Edit Copy** Use this command to make a copy of the selected characters and place them on the Clipboard, replacing the Clipboard's contents. After you copy a selection, you can use the Edit Paste command to paste it in the formula bar at the insertion point.
- **Edit Paste** With this command you can place the contents of the Clipboard in the formula bar at the insertion point. As a time-saver when you're creating long formulas or labels, use the Edit Copy and Edit Paste commands to repeat characters in another part of the formula or label.
- **Edit Clear** Use this command to delete the selected characters from the cell entry. The characters are not stored on the Clipboard.

In addition to pasting the contents of the Clipboard at the insertion point in the formula bar, you can paste it into a blank cell, into a formula in another cell, or in place of selected text. You can also paste and insert the contents of the Clipboard between existing cells on a worksheet. For more information on editing worksheet data and formulas, see Chapter 4, "Editing a Worksheet."

While editing your worksheet, keep in mind that you can undo or repeat most editing actions and commands by choosing the Edit Undo command or the Edit Repeat command immediately after performing an action or choosing a command.

The following table shows some key combinations you can use to edit a cell entry.

IMPORTANT If you press DELETE when the formula bar is not active (the enter and cancel boxes are not displayed), Microsoft Excel activates the formula bar and deletes the contents of the formula bar and the active cell. To undo this, you can choose the Edit Undo command or click the cancel box.

Key	Without characters selected	With characters selected
DELETE	Deletes the character to the left of the insertion point	Deletes the selection
COMMAND+X	—	Cuts the selection to the Clipboard
COMMAND+C	—	Copies the selection to the Clipboard
COMMAND+V	Pastes the Clipboard data at the insertion point	Replaces the selection with the Clipboard data

Editing a cell entry

1. Click the cell that contains the data you want to change.

   The value or formula contained in the active cell appears in the formula bar.

2. Press COMMAND+U to activate the formula bar and enter Edit mode.

   The enter (☑) and cancel (☒) boxes appear in the left side of the formula bar. The message "Edit" appears in the status bar to indicate that Microsoft Excel is in Edit mode.

3. In the formula bar, click to position the insertion point or drag through characters to select them.
4. Edit the cell entry with the editing techniques described earlier in this section.
5. To enter your edits in the cell, click the enter box.

   To cancel your edits and restore the previous cell entry, click the cancel box.

1. Use the movement keys to move to the cell that contains the data you want to change.

   The value or formula contained in the active cell appears in the formula bar.

2. Press COMMAND+U to activate the formula bar and enter Edit mode.

   The enter (☑) and cancel (☒) boxes appear in the left side of the formula bar. The message "Edit" appears in the status bar to indicate that Microsoft Excel is in Edit mode.

3. Use the ARROW keys to move the insertion point in the formula bar, or hold down SHIFT and use the ARROW keys to select characters.
4. Edit the cell entry using the editing techniques described earlier in this section.
5. To enter your edits in the cell, press ENTER.

   To cancel your edits and restore the previous cell entry, press COMMAND+PERIOD.

Copying or moving characters within a cell entry

1. Select the cell that contains the data you want to copy or move.
2. In the formula bar, select the characters you want to copy or move.
3. To copy characters, choose Edit Copy.

   To move characters, choose Edit Cut.

4. Move the insertion point in the formula bar to where you want to paste the characters.
5. Choose Edit Paste.

Copying or moving characters from one cell to another

1. Select the cell that contains the data you want to copy or move.
2. In the formula bar, select the characters you want to copy or move.
3. To copy the selection, choose Edit Copy.

   To move the selection, choose Edit Cut.

4. Press COMMAND+PERIOD to deactivate the formula bar and make the worksheet active.
5. Select the cell into which you want to paste the characters.
6. If you're copying to a cell that contains data, position the insertion point in the formula bar where you want to paste the characters.
7. Choose Edit Paste.

Undoing a command or action

If you change your mind or make a mistake while working on a document, you can choose the Edit Undo command to reverse certain commands and actions immediately after you complete them. The Undo command on the Edit menu changes to show the most recent command or action that is affected by Edit Undo. If Edit Undo does not apply, the words "Can't Undo" appear dimmed on the menu. Remember, you can undo only the last command you chose or the last cell entry you typed.

▶ Choose Edit Undo.

Microsoft Excel changes the command name displayed on the Edit menu to Redo. If you want to reverse the Undo command itself, choose Edit Redo.

▶ Press COMMAND+Z.

Microsoft Excel changes the command name displayed on the Edit menu to Redo. If you want to reverse the Undo command itself, press COMMAND+Z again.

Repeating a command or action

If you want to repeat the last command you chose, for example, when you're applying the same formats to different groups of cells, you can use the Edit Repeat command. The Edit Repeat command is available for any command that can be repeated. For example, this command is not available when you choose the File Close All command, because there would be no open windows to close. When the Edit Repeat command does not apply, the message "Can't Repeat" appears dimmed on the menu.

▶ Choose Edit Repeat.

Microsoft Excel repeats the last command you chose, including any options you changed in the dialog box.

▶ Press COMMAND+Y.

Microsoft Excel repeats the last command you chose, including any options you changed in the dialog box.

Inserting Text Automatically

You can insert times and dates, or copy data into the formula bar with the special keys shown in the following table. For information on creating and using formulas, see "Entering a Formula," later in this chapter.

Key	Action
COMMAND+HYPHEN	Inserts the current date in the formula bar
COMMAND+;	Inserts the current time in the formula bar
COMMAND+'	Copies the value from the cell above the active cell into the formula bar
OPTION+ENTER	Fills selection with formula
COMMAND+ENTER	Enters the formula as an array formula

MORE ABOUT

More About Editing Worksheet Data

Guidelines

Editing Data in More Than One Worksheet at the Same Time When you're working with similar worksheets, you can save time by selecting these worksheets as a workgroup. The data you enter and the changes you make in the active worksheet are automatically duplicated in the same location in all the sheets in the workgroup. For information on defining a workgroup and a list of Microsoft Excel commands that can be used with a workgroup, see "Editing Worksheets as a Group" in Chapter 8.

Microsoft Excel Commands Available When the Formula Bar Is Active In addition to the Edit Cut, Edit Copy, Edit Paste, and Edit Clear commands discussed in this section, the following commands are available when the formula bar is active:

- **Formula Paste Function** Use this command to paste a worksheet function. To do this, position the insertion point in the formula and choose the Formula Paste Function command. In the Paste Function box, select the worksheet function you want and choose OK. For information on using worksheet functions, see "Using Worksheet Functions to Simplify Formulas," later in this chapter.
- **Formula Reference** Use this command to convert a selected reference in the formula bar to relative, absolute, or mixed. For information on using references, see "Entering a Formula," later in this chapter.
- **Formula Goto** Use this command to scroll to and select a named area or reference in another part of the worksheet or on a different worksheet. For example, you can quickly change the location of the active cell by choosing the Formula Goto command and typing the reference of the cell you want. You can easily go back to where you were by choosing the Formula Goto command again.
- **Formula Paste Name** In Microsoft Excel, you can assign a name to a cell or a group of cells. You can then refer to the named cell or cell range using the name rather than cell references. To paste a name, position the insertion point in the formula bar and choose the Formula Paste Name command. In the list, select the name you want to paste and choose OK. For information on using names, see "Naming Cells and Formulas" in Chapter 6.
- **Options Calculate Now** Use this command while the formula bar is active to replace the formula or the selected part of the formula in the active cell with the calculated result of the formula or partial formula.

MORE ABOUT

- **Options Short Menus** You'll see this command when Microsoft Excel is using full menus. To display only the commands you use most often, choose the Options Short Menus command. To display all Microsoft Excel commands, choose the Options Full Menus command.
- **Window Help** Use this command to display Help information. For information on using online Help, see "Using Help" in Chapter 1.
- **Window Show Clipboard** Use this command to show the contents of the Clipboard.
- **Window Arrange All** Use this command to display all open document windows quickly, so none overlap.
- **Window 1,2,3...9** Use this command to make a window active. The window names that appear are the ones that are currently open.

Using an Extended Keyboard to Enter Data If you have an extended keyboard, you can use the following features to help you enter data and move around the formula bar or worksheet more efficiently:

- In addition to pressing COMMAND+PERIOD to cancel an entry or edit in the formula bar, you can press ESC. In fact, pressing ESC works the same way as pressing COMMAND+PERIOD for any action you want to cancel in Microsoft Excel. For example, if you change your mind after you have chosen the File Print command to print your worksheet, you can press either ESC or COMMAND+PERIOD to cancel printing.
- You can use the numeric keypad, the square group of numeric and arithmetic keys to the right of the standard keyboard keys, either to enter numbers or to work as ARROW keys. To enter numbers from the numeric keypad, press SHIFT+NUM LOCK until the message "NUM" appears in the status bar. Press SHIFT+NUM LOCK (CLEAR) to turn Num Lock on or off.

  To use the numeric keypad keys as ARROW keys, turn off Num Lock by pressing SHIFT+NUM LOCK (CLEAR); the message "NUM" disappears from the status bar. The numbers on the keypad correspond to the ARROW keys as follows: the 2 key is DOWN ARROW, the 8 key is UP ARROW, the 4 key is LEFT ARROW, and the 6 key is RIGHT ARROW.

"Accountant's Keypad" Feature You can set up "fixed decimals" with Microsoft Excel just as you would on a 10-key adding machine. You can specify a number of decimal places and Microsoft Excel will automatically insert the decimal point correctly for each number you enter. To do this, choose the Options Workspace command, turn on the Fixed Decimal check box, and enter the number of decimal places you want in the Places box.

MORE ABOUT

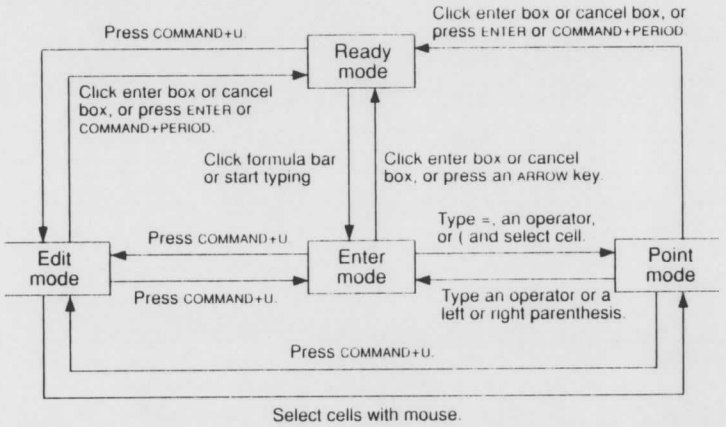
If you use the numeric keypad (located on the right side of most keyboards) to enter the numbers, be sure to turn on Num Lock. When Num Lock is on, the message "NUM" appears in the status bar. Press SHIFT+NUM LOCK (CLEAR) to turn Num Lock on or off.

Extending the Selection with the Formula Goto Command You can extend the selection from the active cell to the Goto area by either holding down SHIFT when you choose OK in the Formula Goto dialog box or, if you're using an extended keyboard, by pressing F8 before choosing the Formula Goto command.

Using the Formula Goto Command with a Multiple Selection To add the Goto area to a multiple selection, you can either hold down CTRL when you choose OK in the Formula Goto dialog box or, if you're using an extended keyboard, you can press SHIFT+F8 before choosing the Formula Goto command.

Modes in Microsoft Excel Microsoft Excel can be in one of four modes, depending on its current activity. For example, when you first start Microsoft Excel, the application is in Ready mode, waiting for you to select cells, enter data, or choose commands. The formula bar is not active, and the status bar at the bottom of the screen displays "Ready." In addition to Ready mode, Microsoft Excel has three other modes—Enter, Edit, and Point—used for entering and editing data.

Instructions for using the three data entry and editing modes follow the illustration which shows the different modes and how to move among them. Remember that movement keys include the ARROW keys (UP, DOWN, LEFT, or RIGHT), HOME, END, PAGE UP, and PAGE DOWN and their related key combinations such as SHIFT+HOME.


Press COMMAND+U.
Click enter box or cancel box, or press ENTER or COMMAND+PERIOD
Ready mode
Click enter box or cancel box, or press ENTER or COMMAND+PERIOD.
Click formula bar or start typing
Click enter box or cancel box, or press an ARROW key.
Type =, an operator, or (and select cell.
Press COMMAND+U.
Edit mode
Enter mode
Point mode
Press COMMAND+U.
Type an operator or a left or right parenthesis.
Press COMMAND+U.
Select cells with mouse.

MORE ABOUT

- **Enter mode** This is the basic data entry mode for the active cell. In Enter mode, the formula bar is active and movement keys operate on worksheet cells. The status bar displays "Enter."
  - To turn on Enter mode, start typing data for the active cell, and Microsoft Excel automatically activates the formula bar in this mode.
  - To erase mistakes, press DELETE. To cancel the entry, press COMMAND+PERIOD.
  - To exit Enter mode and return to Ready mode, complete the cell entry by clicking the enter box or by pressing ENTER. If only a single cell is selected, you can press a movement key to move when you complete the entry.

    You can also return to Ready mode by clicking the cancel box or by making a different selection on the worksheet.
- **Edit mode** This mode is used for editing the contents of the active cell in the formula bar. In Edit mode, the formula bar is active, and movement keys operate on characters in the formula bar. You can turn on Edit mode from either Enter or Ready mode. In Edit mode, the status bar displays "Edit."
  - To turn on Edit mode from Ready or Enter mode, press COMMAND+U.
  - To edit, click where you want the insertion point or drag through characters to select them. Or, use the movement keys to select a range of characters.
  - To switch to Enter mode before completing the entry, press COMMAND+U again.
  - To complete a cell entry from Edit mode, click the enter box or press ENTER.
- **Point mode** This mode simplifies entering cell and range references in a formula in the active cell. You can use Point mode only when you are entering a formula. In Point mode, the formula bar is active and movement keys operate on worksheet cells; however, instead of changing the worksheet selection, Microsoft Excel enters cell references in the formula bar. The status bar displays "Point." For detailed instructions on using point mode when you enter a formula, see the following section, "Entering a Formula."

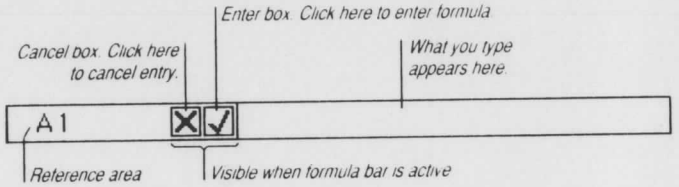
Tip

Hiding or Displaying the Formula Bar Normally, Microsoft Excel displays the formula bar. However, if you want to suppress the display of formulas in worksheets and charts for security purposes, you can hide the formula bar. Then, when you type data into a cell, you will see the data in that cell but not in the formula bar. After you've entered a formula, the formula will not be visible anywhere on the worksheet. To hide the formula bar, choose the Options Workspace command and turn off the Formula Bar check box. This setting applies to all your Microsoft Excel sessions until you change the setting. To display the formula bar, choose the Options Workspace command and turn on the Formula Bar check box.

Entering a Formula

Entering a formula is the basic technique you use to analyze data on your worksheet. With a formula you can perform operations, such as addition, multiplication, and comparison, on worksheet values. Use a formula when you want to enter calculated values on the worksheet.

A formula can include any the following elements: operators, cell references, values, worksheet functions, or names. To enter a formula in a worksheet cell, you enter a combination of these elements in the formula bar.


Enter box. Click here to enter formula
Cancel box. Click here to cancel entry.
What you type appears here.
A1
Reference area
Visible when formula bar is active

You should already know how to activate, edit in, and select in the formula bar. This section does not include procedures for using the formula bar. For information on using the formula bar, see the sections listed in the following table.

For information on	See
Selecting and editing in the formula bar	"Editing Worksheet Data" earlier in this chapter
Entering text, dates, times, and constant numbers	"Entering Worksheet Data" earlier in this chapter
Calculation	"Controlling Calculation" in Chapter 7
Selecting formulas	"Selecting Cells and Moving Around the Worksheet" earlier in this chapter and "Finding and Replacing Cells and Data" in Chapter 4
Copying and moving formulas	"Moving and Copying Data and Formats" in Chapter 4
Deleting formulas	"Clearing and Deleting Cells, Rows, and Columns" in Chapter 4

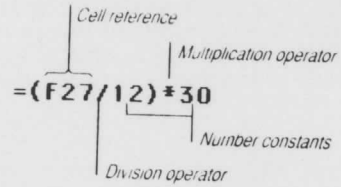
Online Help also provides information on entering a formula. To display online Help, choose the Window Help command. If you are using system software version 7.0 and the Help command does not appear on the Window menu, display Help by pointing to the Help menu icon and choosing the Microsoft Excel Help command. For information on a specific command, select the Commands topic. For information on using online Help, see "Using Help" in Chapter 1.

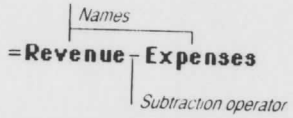
Using Formulas

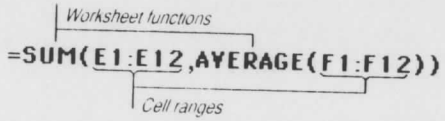
A *formula* combines values with operators, such as a plus sign or minus sign, in a cell to produce a new value from existing values. A formula can include names or references to cells in place of, or in addition to, constant values and can also use worksheet functions instead of operators. This section discusses using operators and references. For information on names, see "Naming Cells and Formulas" in Chapter 6. For information on worksheet functions, see the following section, "Using Worksheet Functions to Simplify Formulas."

You can think of a formula as one side of an equation whose result is shown in the cell. A formula always begins with an equal sign (=).

The following illustration shows the types of data you can include in a formula:







Using Operators

You use *operators* to specify the operation, such as addition, subtraction, or multiplication, to perform on the operands (values on either side of the operator) in the formula. Microsoft Excel uses four types of operators:

Type of operator	Example	Operator	Description
Arithmetic Performs basic mathematical operations; combines numeric values and produces numeric results.	For example, the formula =20^2*15% raises 20 to the power of 2 and multiplies the result by 0.15 to produce a result of 60.	+	Addition
		-	Subtraction (negation if used with one operand only)
		/	Division
		*	Multiplication
		%	Percentage (takes one operand)
		^	Exponentiation
Text Joins two or more text values into a single combined text value (useful when using functions that produce text).	For example, if cell E1 contains the text "Q4 1990" and cell A20 contains the formula ="Totals for "&E1, cell A20 would display the text "Totals for Q4 1990."	&	Connects, or concatenates, two text values to produce one continuous text value; if an operand is a cell reference and the referenced cell contains a formula, this operator joins the value produced by the formula in the referenced cell as a text value
Comparison Compares two values and produces the logical value TRUE or FALSE.	For example, the formula =Profit<25000 produces the value TRUE if the value of Profit is less than $25,000. If the value is greater than or equal to $25,000, this formula produces the logical value FALSE.	=	Equal
		>	Greater than
		<	Less than
		>=	Greater than or equal to
		<=	Less than or equal to
		<>	Not equal to

Type of operator	Example	Operator	Description
Reference Combines two cell references into a single joint reference	For example, A1:A10 refers to cells A1 and A10 and all cells in between	:	Range—produces one reference to all the cells between and including the two references
		Space	Intersection—produces one reference to the cells common to the two references, or the #NULL! error value when the two references have no cells in common
		,	Union—produces one reference that includes the two references

Some operators act on two operands; others act on one. The formula =5+2 uses two operands, whereas the formula =3% uses only one operand; the percentage operator divides the operand (3) by 100 to produce the value 0.03.

For information on the order in which operators are evaluated in a formula, see "More About Entering a Formula," later in this section.

Using References

A *reference* identifies a cell or a group of cells on a worksheet. References tell Microsoft Excel which cells to look in to find the values you want used in a formula. Using references, you can use data contained in different parts of a worksheet in one formula and use one cell's value in several formulas.

In Microsoft Excel, you can also refer to cells in other worksheets and data in other applications. References to cells in other worksheets are called *external references*. References to data in other applications are called *remote references*. For information on external and remote references, see "Linking Documents" in Chapter 8.

Cell references are based on the column and row headings in a worksheet. When you first start Microsoft Excel, columns are labeled with alphabetic letters (A, B, C, ... Z; AA, AB, AC, ... AZ; BA, BB, BC, and so on) and rows are numbered. This is known as A1 reference style. You can also change the column headings to be numbers instead of letters. This is known as R1C1 reference style. For information on R1C1 reference style, see "More About Entering a Formula," later in this section. The reference of the active cell is displayed in the Reference area to the far left of the formula bar.

Relative vs. Absolute References

There are two basic types of references: *relative references* and *absolute references*.

A relative reference is like giving someone directions that explain where to go from where that person started—"go up two blocks and over one." An absolute reference is like giving someone a street address—"3812 Atlantic St."

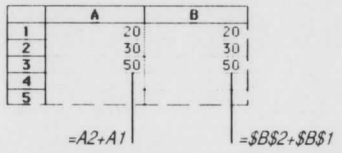
A relative reference tells Microsoft Excel how to find another cell, starting from the cell containing the formula. References such as C4 and F7 are relative references.

An absolute reference tells Microsoft Excel how to find a cell based on the exact location of that cell in the worksheet. An absolute reference is designated by adding a dollar sign ($) before the column letter and the row number. References such as $D$9 and $F$16 are absolute references.

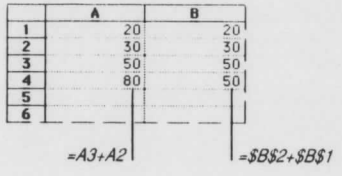
To enter	Type
Relative reference	A1
Absolute reference	$A$1

Use a relative reference (such as B5) if you always want to refer to cells relative to the cell containing the formula, even if you copy or move the formula. Use an absolute reference when you want to refer to the same cell regardless of where the formula is located on the worksheet.

For example, in the following illustration, both cells in the third row have formulas that calculate the sum of the values in the two cells immediately above them. The formula in A3 is built with relative references; the one in B3 is built with absolute references:



When you copy the formulas from row 3 into row 4, the results of both formulas are correct, but the answers are different:



Since the formula copied from A3 to A4 contains relative references, the references adjust from A2 and A1 to A3 and A2, which produces 30+50=80. Because a relative reference in a formula remembers the position of a cell relative to the cell containing the formula, Microsoft Excel adjusts the reference to reflect the new position when the formula is copied elsewhere. In this example, Microsoft Excel always looks in the two cells immediately above the formula for values to add, which are different cells each time the formula is copied or moved.

The formula =$B$2+$B$1 always adds the values in cells B2 and B1. No matter where you copy this formula on the worksheet, Microsoft Excel looks in cells B2 and B1 for values to add.

For information on copying and moving formulas, see "Moving and Copying Data and Formats" in Chapter 4.

You can combine absolute and relative row and column references in a reference so that only the column is absolute or only the row is absolute. For example, the formula =$A1 always refers to column A no matter where you copy the formula, but the row number is relative so it changes if you copy the formula to a different row. A reference containing a combination of relative and absolute row and column references is called a *mixed reference*. For more information about mixed references, see "More About Entering a Formula," later in this section.

Techniques for Entering a Formula

When the formula bar is active, you can use several techniques to enter a formula or part of a formula. You can type the formula, paste functions and names into the formula, or insert references in the formula by selecting cells. You can also paste a formula linked to another worksheet. This type of formula is called a linked formula and is useful if you want a formula in one worksheet to be dependent on values in another worksheet. For more information on linking worksheets, see "Linking Documents" in Chapter 8.

Entering a formula

You can type values, references, names, operators, and functions into a formula. Always begin the formula with an equal sign (=). You can type letters in either uppercase or lowercase. Microsoft Excel automatically converts lowercase references and function names to uppercase after you enter the formula.

1. Select the cell into which you want to enter the formula.
2. Type an equal sign (=) to activate the formula bar, or paste a function using the technique described in the following procedure, "Pasting a Worksheet Function into a Formula."

   If you begin a formula by pasting a function, Microsoft Excel automatically inserts the equal sign.
3. Type the formula or combine the typing and pasting techniques discussed in the following procedures to build the formula.

   If you make a mistake, use the editing techniques described in the "Editing Worksheet Data" section, earlier in this chapter, to correct the error.
4. Click the enter box (☑) or press ENTER.

   If Microsoft Excel is in Enter mode (Enter is displayed in the status bar), you can also use an arrow key to enter the formula and move to another cell. Make sure the insertion point does not immediately follow an operator or left parenthesis; in this case, pressing an arrow key enters a cell reference.

NOTE To enter the same formula into a range of cells, first select the range and type the formula, and then enter it by pressing OPTION+ENTER. For information on selecting a range of cells, see "Selecting Cells and Moving Around the Worksheet," earlier in this chapter.

Canceling a formula

While entering a formula or immediately after you enter a formula, you can undo your entry and restore the previous cell contents.

To cancel a formula before you enter it:

▶ Click the cancel box (☒) or press COMMAND+PERIOD.

To undo a formula immediately after you enter it:

▶ Choose Edit Undo Entry.

Pasting a worksheet function into a formula

1. To insert a function at the beginning of the formula, select the cell into which you want to enter the formula.

   To insert a function elsewhere in the formula, position the insertion point where you want to insert the function and type the preceding operator or left parenthesis.
2. Choose Formula Paste Function.

   Microsoft Excel displays a dialog box listing all of the available worksheet functions, including custom functions.
3. In the Paste Function box, select the worksheet function you want to paste.

   The function and its arguments are shown below the list of available functions. Microsoft Excel pastes placeholders to remind you which arguments are needed for the function. If you don't want placeholders, turn off the Paste Arguments check box.
4. Choose OK.

   If you begin a formula by pasting a function, Microsoft Excel automatically inserts the equal sign.

5 Type or edit the arguments.

You must replace placeholders with real arguments. If there is more than one argument, make sure they are separated by commas. If you want to omit an optional argument, leave a comma in its place.

6 When you finish editing the formula, click the enter box or press ENTER.

For more information on using worksheet functions, see the following section, "Using Worksheet Functions to Simplify Formulas."

Pasting a name into a formula

In Microsoft Excel you can assign a name to a cell or a group of cells. You can then refer to the named cell or cell range using the name rather than cell references, and you can include it in a formula. For more information on using names, see "Naming Cells and Formulas" in Chapter 6.

1 Position the insertion point in the formula bar where you want to paste the name.

2 Choose Formula Paste Name.

3 In the Paste Name box, select the name you want to paste.

4 Choose OK.

Entering cell references in a formula by selecting

While the formula bar is active, you can insert references in your formula by selecting cells on the worksheet instead of typing the references.

1 To insert a cell reference at the beginning of the formula, type an equal sign to start the formula or position the insertion point following the equal sign.

To insert a reference elsewhere in the formula, position the insertion point where you want to insert the reference and type the preceding operator or left parenthesis.

2 Click the cell or drag through the cell range on the worksheet.

With the keyboard, press the arrow keys to select a cell; press SHIFT+ARROW to extend the selection from the active cell. If pressing an arrow key moves the insertion point in the formula bar or does nothing, press COMMAND+U to switch to Enter mode before selecting the cells. The status bar displays Enter when you are in Enter mode.

3 To continue the formula, type the next operator or parenthesis and repeat step 2.

4 Click the enter box or press ENTER.

NOTE If you are entering a reference with the mouse, and you want to precede the reference with the addition operator (+), you do not have to type the plus sign before selecting the cell or cell range. Microsoft Excel automatically precedes the reference with a plus sign if you don't type an operator or a left parenthesis. This is a quick way to build a formula that sums several cells or cell ranges.

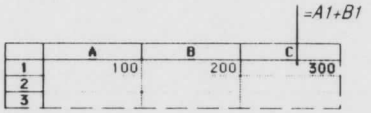
For more information on inserting cells by selecting, see "More About Entering a Formula," later in this section.

Entering a Formula as an Array Formula

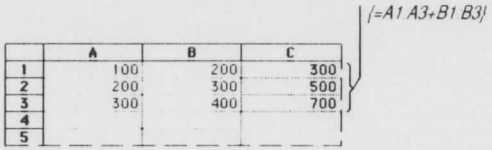
If you find yourself entering the same formula in adjacent cells and changing just the formula's cell references to match the new row or column, you may be able to save yourself time by entering the formula as an *array formula*. Entering a formula as an array formula can also reduce the amount of memory used by your worksheet. When you enter an array formula, you enter one formula for all the cell ranges on which you want to perform the same operation or set of operations, and you don't have to repeat the formula for each cell range.

This section is an introduction to array formulas. For full details on array formulas, see "Creating and Using an Array Formula" in Chapter 7.

To understand how an array formula works, consider an ordinary, single-value formula. A single-value formula produces a single result from one or more operands. For example, the formula =A1+B1 produces a single result—the sum of the values in cells A1 and B1:



An array formula can produce more than one result from sets of operands. Each result is entered in a separate cell. For example, the array formula {=A1:A3+B1:B3} produces a set of three results:



Note that Microsoft Excel encloses all array formulas in braces ({ }). If you select any cells in the range containing the array formula, the same array formula is displayed in the formula bar. You cannot change or delete just one cell in the array formula range because all the cells share a single formula. However, you can format cells in an array range independently.

Entering an array formula

1 Select the range of cells in which you want to enter the formula.

2 Build the formula using the techniques described for ordinary formulas, making sure to include all the cell ranges for the multiple results you want.

Do not type the braces around the formula; Microsoft Excel adds the braces automatically when you enter the formula as an array formula.

3 Press COMMAND+ENTER

Editing an array formula

1 Select any cell in the range.

2 Activate the formula bar.

The braces are not displayed when the formula bar is active.

3 Edit the formula.

4 Press COMMAND+ENTER

MORE ABOUT

More About Entering a Formula

Guidelines

Entering Text in a Formula When you enter text in a formula, you must include double quotation marks around the text value. Without the double quotation marks, Microsoft Excel interprets the text as a name or number. If you want to include quotation marks within the text, use two double quotation marks for each double quotation mark that you want to display. For example, to enter the text a"b"c as a formula, type ="**a""b""c**". Also, remember to start the formula with an equal sign if you want to use the entry as a formula.

Order of Evaluation of Operators If you combine several operators in a single formula, Microsoft Excel performs the operations in the following order:

Operator	Description
:	Range
Space	Intersection
,	Union
-	Negation (single operand)

MORE ABOUT

Operator	Description
%	Percent
^	Exponentiation
* and /	Multiplication and division
+ and -	Addition and subtraction
&	Text joining
= < > <= >= <>	Comparison

If the formula contains more than one operator with the same priority, for example, several comparison operators, Microsoft Excel evaluates the operators from left to right. If you want to alter the order of evaluation, use parentheses to group expressions in your formula. Microsoft Excel first calculates the expressions in parentheses, and then uses those results to calculate the formula. For example:

This formula	Produces this value
=2+4*5	22
=(2+4)*5	30

Referencing a Cell Range in an Ordinary Formula Operands for ordinary formulas (not array formulas) should be single values, references to single cells, or names that refer to single cells or constant values. In a formula, if you specify a reference to a row or column of cells that should be a reference to a single cell, Microsoft Excel chooses just one cell from that reference on which to perform the operation or function. If the reference is a row, Microsoft Excel chooses the cell that is in the same column as the cell containing the formula; if the reference is a column, Microsoft Excel chooses the cell that is in the same row as the cell containing the formula. For example, as shown in the following illustration, if you enter the formula =A1:F1-A2:F2 in cells C3 and F3, Microsoft Excel subtracts C2 from C1 and F2 from F1:

	A	B	C	D	E	F
1	9	3	5	7	5	7
2	5	8	4	7	1	2
3			1			5
4						
5						

Cells C3 and F3 contain the same formula (=A1:F1-A2:F2), but only the cells immediately above C3 and F3 are subtracted.

MORE ABOUT

Reference Operators With the reference operators (colon, comma, and space), you can combine absolute references, relative references, and named areas. You may want to do this if you always use the same cell to anchor the reference area, but the extent of the range changes depending on where you copy the formula. For example, if you enter the formula =SUM($A$1:B5) in cell B6 and then copy cell B6 to cell C6, Microsoft Excel adjusts only the relative reference B5 so cell C6 contains the formula =SUM($A$1:C5). If the range $A$1 through $B$5 was named "Sales" you could combine the name and reference by entering the formula =SUM(Sales:C5) in C6 to produce the same result as the previous formula.

When using a range reference operator to refer to entire columns, rows, or a range of entire columns or rows, you can use the following abbreviated forms of the references:

To refer to	Type
All of column A	A:A
All of row 1	1:1
All of rows 1 through 3	1:3
Entire worksheet	A:IV or 1:16384

When you build formulas by selecting entire rows or columns, Microsoft Excel uses these abbreviated range references.

How Microsoft Excel Converts Operand Values When you enter a formula, Microsoft Excel expects certain types of values as operands for each operator. If you enter something that is different from what Microsoft Excel expects, Microsoft Excel converts the value, if possible. This feature gives you more flexibility when using formulas. You will rarely have to resort to special functions to convert between types of values.

The following list gives some examples of how Microsoft Excel converts values:

- **Converting to numbers** In the formula ="1"+"2", the plus sign causes Microsoft Excel to expect numbers. Even though the quotation marks mean that "1" and "2" are text values, Microsoft Excel automatically converts the text to numbers and produces the number 3.

  When Microsoft Excel expects a number, it converts text if the text is in a format that the formula bar would accept for a number constant. For example, it converts the formula =1+"$4.00" and produces the value 5. For the formula =SQRT("Sunday"), Microsoft Excel cannot convert the text to a number because it is not in a format the formula bar would accept for a number constant. It would produce the #VALUE! error value. Microsoft Excel converts the value FALSE to the number 0, and TRUE to 1.

MORE ABOUT

Because Microsoft Excel can convert text to numbers, you can easily enter serial numbers for dates and times within formulas. You do this by entering into the formula, as text, the date formatted in one of the Microsoft Excel date or time formats. For example, in the formula ="6/1/90"-"5/1/90", Microsoft Excel converts the dates to serial numbers and produces the value 31.

- **Converting to text** When Microsoft Excel expects text, it converts all numbers and logical values to text. For example, it converts the formula ="A="&TRUE to the text value A=TRUE, and the formula ="A="&5 to the text value A=5.
- **Converting to logical values** When Microsoft Excel expects a logical value, it converts the number 0 to FALSE and other numbers to TRUE. For example, it converts the formula =IF(0,"right","wrong") and produces the value "wrong." When expecting a logical value, Microsoft Excel produces the #VALUE! error value when it encounters any text other than "true" or "false." For example, the formula =IF("true","right","wrong") produces the value "right," and the formula =IF("correct","right","wrong") produces the #VALUE! error value, because "correct" cannot be converted to a logical value.

Changing to R1C1 Reference Style Most examples in this book use the A1 reference style, in which the columns are labeled with letters and the rows with numbers. However, Microsoft Excel provides an alternate way of referring to cells, called R1C1 reference style, in which both rows and columns are numbered. This style is useful for computing row and column positions in macros, and is especially useful for showing relative references.

In R1C1 style, a cell's location is indicated by an R followed by a row number and a C followed by a column number. For example, the reference R2C2 is equivalent to the absolute reference $B$2 in A1 reference style. If the active cell is B3, the relative reference R[2]C[2] refers to the cell two rows down and two columns to the right, or cell D5 in A1 reference style. When you change to R1C1 style, Microsoft Excel changes all references in your formulas accordingly and displays numbered column headings. If you change back to A1 style, Microsoft Excel changes all references in your formulas back to A1 style and displays letters in the column headings.

To change the reference style, choose the Options Workspace command. To use R1C1 style, turn on the R1C1 check box; to use A1 style, turn off the R1C1 check box. Choose OK. Microsoft Excel displays the appropriate column headings and automatically adjusts all the references in your formulas to match the current style.

MORE ABOUT

Entering R1C1 References Just as in A1 style, if you select a cell while building a formula in R1C1 style, you enter a relative reference. For example, if you are entering a formula in cell R3C1 and select cell R2C2, Microsoft Excel enters R[-1]C[1] as the reference. If the cell you select is in the same row or column, Microsoft Excel does not enter R[0]C[1] or R[-1]C[0], but instead abbreviates the reference and enters RC[1] or R[-1]C.

The following table shows other examples of references in R1C1 style:

This relative reference	Indicates the cell
R[-2]C	Two rows up, same column
RC[-2]	Same row, two columns to the left
R[2]C[2]	Two rows down, two columns to the right

You can enter references to an entire row or column by omitting one half of the reference. For example, enter R[-1] to indicate the entire row above the active cell.

You can also type references instead of selecting cells. For example, type **r[2]c[2]** to enter a relative reference. Type **r2c2** to enter an absolute reference.

As in A1 style, you can mix relative and absolute references in R1C1 style and use the Formula Reference command (described in the following tips) to change references.

Tips

Using Mixed References and Changing Relative and Absolute References If you want to refer to cells so that only the column or row reference is absolute or relative, use mixed references. For example, in the reference $A2, the column reference ($A) is absolute and the row reference (2) is relative. If you entered the reference $A2 in cell A3 and then copied cell A3 to cell B13, Microsoft Excel would adjust the row reference but not the column reference and would enter the reference $A12 in cell B13.

You can type a mixed reference directly, or you can use the Formula Reference command to change a reference. The Formula Reference command cycles through absolute, mixed, and relative references, starting with the current reference, in the following order:

This reference	Becomes
A1	$A$1
$A$1	A$1
A$1	$A1
$A1	A1

MORE ABOUT

To change the reference format, first select the cell containing the reference you want to change. Next, in the formula bar, select the reference or references you want to change. Then choose the Formula Reference command as many times as necessary to change the reference to the desired combination of absolute and relative references. With the keyboard, press COMMAND+I to cycle through the reference formats.

If you are entering a formula and have just inserted a reference you want to change, choose the Formula Reference command while the insertion point is still to the right of the cell reference. Microsoft Excel converts the reference to the left of the insertion point. If the insertion point is within a reference, choosing Formula Reference changes that reference.

Matching Parentheses Microsoft Excel shows you the matching left parenthesis when you type a right parenthesis in the formula bar so you can make sure you have the correct number of parentheses in a formula. When you move the insertion point past a parenthesis, Microsoft Excel temporarily displays the parenthesis and its matching parenthesis in bold format.

Displaying Formulas on the Worksheet You can display the formulas in the cells on a worksheet instead of the values produced by the formulas. Initially, Microsoft Excel displays values on the worksheet. The active cell's formula is displayed only in the formula bar and only in the cell when you are editing the formula. To show formulas instead of values on the worksheet, choose the Options Display command, turn on the Formulas check box, and choose OK. This option applies only to the selected worksheet or workgroup. For more information on customizing your display, see "Changing How Your Worksheet Is Displayed" in Chapter 5.

Replacing a Formula with Its Resulting Value If you want to "freeze" a formula so it is no longer recalculated when you make changes to other cells, you can replace the formula with its resulting value. The cell formula is permanently deleted if you replace it with its value.

To replace a cell formula with its value, select the cell containing the formula you want to replace with the resulting value. Activate the formula bar and choose the Options Calculate Now command. Click the enter box or press ENTER.

Entering Formulas in Lotus 1-2-3 Style When typing a formula that begins with a function, you can start it with the @ symbol instead of an equal sign and Microsoft Excel will automatically convert the @ to an equal sign when you click the enter box or press ENTER to enter the formula.

MORE ABOUT

Pasting Characters from the Clipboard into a Formula You can paste characters from the Clipboard into a formula. While the formula bar is active, choose the Edit Paste command to paste characters that you previously copied from another formula or application. For more information on pasting into the formula bar, see "Editing Worksheet Data," earlier in this chapter.

Troubleshooting

Function or Reference Remains Lowercase If Microsoft Excel does not convert a function name or reference to uppercase letters when you enter the formula, the function or reference is not valid and you should check for typing errors.

Formula Results That Exceed Column Width If a number value produced by a formula is too long to be displayed in a cell that has the General format (the default), Microsoft Excel displays the number in scientific notation. For example, 250,000,000,000 would be displayed as 2.5E+11. If the number in exponential notation is still too long, or if the cell has any format other than General and is too long to fit, Microsoft Excel displays a series of number signs (####) in the cell. If the cell has a number format other than General and you widen the column to accommodate the width of the formula result, Microsoft Excel displays the number in the cell's format. If a formula produces a logical or error value that exceeds the column width of the cell, Microsoft Excel displays a series of number signs in the cell.

If a formula produces a text value that is too long to fit in a cell, Microsoft Excel extends the display of text into the cells to the right until it encounters a cell that is not empty.

You can adjust column widths to display long values. To change the width of a column:

- Point to the vertical line of the column heading and drag to the right to widen the column, or to the left to narrow it.
- Select the column you want to change and choose the Format Column Width command. Choose the Best Fit button or type a column width in the Column Width box and choose OK. Choosing the Best Fit button automatically adjusts the column width to accommodate the longest value displayed in the selected cells in the column. To quickly adjust the column width to the best fit for the longest cell entry in the column, double-click the line to the right of the column heading.

If You Have Problems When Inserting References in a Formula by Selecting Cells Check to make sure that the formula bar is active and that Microsoft Excel is in Enter mode or Point mode. The status bar at the bottom of the workspace displays the current mode. If Microsoft Excel is in Ready mode, selecting cells or cell ranges moves the cell selection on the worksheet but does not change the formula in the formula bar. If Microsoft Excel is in Edit mode, you can insert cell references with the mouse but not the keyboard; the arrow keys move the insertion point in the formula bar.

MORE ABOUT

For more information on Microsoft Excel modes and how they affect editing in the formula bar, see "Entering Worksheet Data," earlier in this chapter.

Follow these guidelines to change modes and insert cell references in a formula:

- **How to enter Point mode** If you are selecting cells with the mouse, you can enter Point mode from Enter mode or Edit mode. Before you select cells you should type the operator you want to precede the cell reference or type a left parenthesis. If you don't type an operator or a left parenthesis, Microsoft Excel automatically precedes the references with a plus sign when you select cells. If you are selecting cells with the keyboard, you can enter Point mode only from Enter mode. To switch from Edit mode to Enter mode, press COMMAND+U.

  If the status bar displays "Ready," just start the formula by typing an equal sign to turn on Enter mode.
- **How to insert a reference** After changing to Enter mode (or Edit mode if you are using a mouse), use the mouse or keyboard to select a cell or range whose reference you want to insert in the formula.

  With the mouse, click the cell or drag through the range you want. With the keyboard, press an arrow key to select a cell; press SHIFT+ARROW to extend the selection if you want to insert a range.

  In both procedures, the cell or range you select is surrounded by a dotted line called the marquee, and the reference to the cell or range appears in the formula bar.
- **How to continue the formula after inserting a reference** After you insert the reference in the formula, type the next operator or parenthesis. Or, complete the formula by clicking the enter box or pressing ENTER.

Formulas That Produce Error Values Microsoft Excel displays an *error value* in a cell when it cannot properly calculate the formula for that cell. Error values always begin with the number sign (#). The error values are:

- #DIV/0!
- #N/A
- #NAME?
- #NULL!
- #NUM!
- #REF!
- #VALUE!

MORE ABOUT

If a formula includes a reference to a cell that contains an error value, that formula also produces an error value (unless you are using the special worksheet functions ISERR, ISERROR, or ISNA that look for error values). You may have to trace the references back through a series of cells to discover the source of the error.

NOTE Even if a worksheet is free of error values, it may contain faulty logic. For information on checking the internal consistency and accuracy of a worksheet, see "Auditing a Worksheet" in Chapter 6.

#DIV/0! The #DIV/0! error value means that a formula is trying to divide by zero.

Possible cause	Suggested correction
Using a reference to a blank cell or a cell containing zero as a divisor. (If an operand should be a number but is blank, Microsoft Excel interprets that blank as zero.)	Change the reference or enter a non-zero value in the cell used as a divisor.
Entering a formula that contains an explicit division by 0 (for example, =5/0).	Correct the formula.
Writing a macro using a macro function that returns #DIV/0! in certain situations.	Look up the functions you are using in the *Microsoft Excel Function Reference*, and see if one or more of your functions returns #DIV/0! in certain situations.

#N/A The #N/A error value stands for "No value is available." This error value can help you make sure you don't accidentally refer to a blank cell. If there are cells on your worksheet that should contain data, but the data is not available yet, you can enter #N/A in those cells. Formulas that refer to those cells will return #N/A, instead of calculating a value.

Possible cause	Suggested correction
Giving an inappropriate argument for *lookup_value* in the HLOOKUP, LOOKUP, MATCH, or VLOOKUP functions.	Adjust the *lookup_value* argument.
Using an array argument that was expanded.	Change the array argument so it can be expanded without #N/A, or so it is the same size as other array arguments. For more information on using arrays, see "Creating and Using an Array Formula" in Chapter 7.

MORE ABOUT

Possible cause	Suggested correction
Omitting one or more arguments to a built-in or custom worksheet function. For example, if the custom function "Deduct" on the macro sheet Calc uses three numbers as arguments, the following formula will return #N/A: =Calc!Deduct(10,D14).	Enter all arguments in the function.
Using a custom worksheet function that did not run successfully. For example, if the function "Deduct" contains an error that prevents it from running, any formula using Deduct will return #N/A.	Correct the custom function, or don't use it.
Writing a macro using a macro function that returns #N/A in certain situations.	Look up the functions you are using in the *Microsoft Excel Function Reference*, and see if one or more of your functions returns #N/A in certain situations.

#NAME? The #NAME? error value results when you use a name that Microsoft Excel doesn't recognize.

Possible cause	Suggested correction
Deleting or failing to define the name.	Define the name.
Misspelling the name.	Correct the spelling. You can use the Formula Paste Name command to insert the correct name into the formula.
Misspelling the name of a function.	Correct the spelling. You can use the Formula Paste Function command to insert the correct function name into the formula.
Entering text without double quotation marks in the formula. Microsoft Excel interprets your entry as a name even though you intended it to be text.	Enclose the text in the formula in double quotation marks.
Omitting a colon in a range reference. For example, if you enter the formula =SUM(A1D10), Microsoft Excel interprets A1D10 as a name.	Correct the formula. For example, =SUM(A1:D10).

MORE ABOUT

#NULL! The #NULL! error value means that you specified an intersection of two areas that do not intersect.

Possible cause	Suggested correction
Using an incorrect range operator or incorrect cell reference	Use the union operator, the comma (,), if you want to refer to two areas that don't intersect. Or check for typing errors in the range specification.

#NUM! The #NUM! error value indicates a problem with a number.

Possible cause	Suggested correction
Using an unacceptable argument in a function that requires a numeric argument. For example, using a negative number as an argument in functions that require positive numbers, such as SQRT(–1).	Correct the argument.
Using a worksheet function that iterates, such as IRR or RATE, and the function is unable to find a result that works.	Try using a different starting guess to the function.
Entering a formula that produces a number that is too large or too small to be represented by Microsoft Excel. For information on limits on the size of numbers in Microsoft Excel, see "Entering Worksheet Data," earlier in this chapter.	Change the formula so that its result is within the allowed range of numbers.

#REF! The #REF! error value occurs when you refer to a cell that is not valid.

Possible cause	Suggested correction
Deleting cells that other formulas refer to or pasting moved cells over cells that other formulas refer to.	Change the formulas. Or reinstate the cells on the worksheet by choosing Edit Undo immediately after deleting or pasting.
Writing a macro using a macro function that returns #REF! in certain situations.	Look up the functions you are using in the *Microsoft Excel Function Reference*, and see if one or more of your functions returns #REF! in certain situations.
Using a remote reference to an application that is not running, or to a topic that is unavailable. (For information on remote references, see "Exchanging Documents with Other Applications" in Chapter 8.)	Start the application; make sure you've used the correct topic.

MORE ABOUT

#VALUE! The #VALUE! error value occurs when you use the wrong type of argument or operand.

Possible cause	Suggested correction
Entering text where a number or logical value is required, and the text can't be translated into the correct data type.	Check the formula or function for the required operand or argument. Check referenced cells for valid values.
Supplying a range to an operator or a function that requires a single value when no cell in the range is in the same row or column as the cell containing the formula or function.	Change the range to a single value.
Using an invalid matrix in one of the matrix worksheet functions.	Correct the matrix.
Writing a macro using a macro function that returns #VALUE! in certain situations.	Look up the functions you are using in the *Microsoft Excel Function Reference*, and see if one or more of your functions returns #VALUE! in certain situations.

Using Worksheet Functions to Simplify Formulas

A *function* is a special prewritten formula that takes a value or values, performs an operation, and returns a value or values. Functions can be used alone or as building blocks in other formulas. Using functions simplifies and shortens formulas in your worksheets and macro sheets, especially those that perform lengthy or complex calculations. For example, instead of typing the formula =A1+A2+A3+A4, you can use the SUM function to create the formula =SUM(A1:A4).

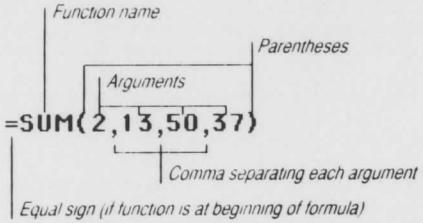
For information on	See
Microsoft Excel functions	The *Microsoft Excel Function Reference*
Custom functions	Chapter 17, "Creating and Using Custom Worksheet Functions"
Using functions on macro sheets	"Creating and Opening a Macro Sheet" in Chapter 18

Online Help also provides information on Microsoft Excel functions. To display online Help, choose the Window Help command. If you are using system software version 7.0 and the Help command does not appear on the Window menu, display Help by pointing to the Help menu icon and choosing the Microsoft Excel Help command. For information on a specific function, select the Worksheet Functions topic. For information on using online Help, see "Using Help" in Chapter 1.

How to Use Functions

You use the Microsoft Excel built-in worksheet functions to perform standard worksheet and macro sheet calculations. The values that you give to a function to perform operations on are called *arguments* to the function. The values that the function returns are called the *results* of the function.

You use functions by entering them in formulas on your worksheet or macro sheet. The sequence of characters you use in a function is called the *syntax* of the function. All functions have the same basic syntax. If you do not follow this syntax, Microsoft Excel displays a message indicating that there is an error in the formula. Here is an example of a function and its syntax:



If a function appears at the beginning of a formula, precede it with an equal sign, as with any formula.

Parentheses tell Microsoft Excel where the arguments begin and end. Remember to include both parentheses, with no spaces preceding or following either parenthesis.

You specify arguments within the parentheses of a function. Arguments can be numbers, text, logical values, arrays, error values, or references. The description of each function in the *Microsoft Excel Function Reference* specifies what each argument should be. The argument you give can be anything, such as a reference or name, that produces the data type necessary for that argument. Some functions accept optional arguments that are not required for the function to perform its calculations.

The arguments to a function can be constants or formulas. The formulas themselves may contain other functions. When an argument to a function is itself a function, it is said to be *nested*. In Microsoft Excel, you can nest up to seven levels of functions in a formula.

Pasting a worksheet function into a formula

You can type a function to enter it into a cell or you can use the Formula Paste Function command. This command saves time and prevents mistyping the function, and can be used while editing a formula.

1. To insert a function at the beginning of a formula, select the cell into which you want to enter the formula.

   To insert a function elsewhere in the formula, position the insertion point where you want to insert the function and type the preceding operator or left parenthesis.

2. Choose Formula Paste Function.

   Microsoft Excel displays a dialog box listing all of the available worksheet functions, including custom functions.

3. Select the worksheet function you want to paste.

   The function and its arguments are shown below the list of available functions. Microsoft Excel pastes placeholders to remind you which arguments are needed for the function. If you don't want placeholders, turn off the Paste Arguments check box.

4. Choose OK.

   If you begin a formula by pasting a function, Microsoft Excel automatically inserts the equal sign.

5. Type or edit the arguments.

   You must replace placeholders with real arguments. If there is more than one argument, make sure they are separated with commas. If you want to omit an optional argument, leave a comma in its place.

6. When you finish editing the formula, click the enter box or press ENTER.

More About Using Worksheet Functions to Simplify Formulas

MORE ABOUT

Guidelines

Formula Length Microsoft Excel accepts formulas up to 4,096 characters long.

Creating Your Own Functions You can create your own functions for specialized calculations you perform often. These functions are called *custom functions*. For information on custom functions, see Chapter 17, "Creating and Using Custom Worksheet Functions."

MORE ABOUT

Listing Worksheet Functions, Macro Functions, and Custom Functions Choosing the Formula Paste Function command when you are working on a worksheet shows the names of worksheet functions. When you are working on a macro sheet, Formula Paste Function shows the names of all worksheet and macro sheet functions. Custom functions are shown at the end of the list of functions for both worksheets and macro sheets, and are preceded by the name of a macro sheet.

Creating Add-in Functions With Microsoft Excel you can create add-in functions that appear in the Formula Paste Function dialog box along with the built-in functions included in Microsoft Excel. Add-in functions help you create custom applications that appear as a part of Microsoft Excel itself. For information on creating add-in functions, see "Creating Add-in Functions and Command Macros" in Chapter 20.

Tips

Automatically Inserting a SUM Formula You can insert a formula with the SUM function at the end of a row or column of data so that Microsoft Excel will automatically fill in the range to be totaled. Select the cell you want to contain the formula, and click the auto-sum button (Σ) in the tool bar, or press COMMAND+SHIFT+T to insert the formula.

Capitalization in a Function When you type a function in lowercase letters, Microsoft Excel converts it to uppercase when you enter the formula.

Entering Formulas in Lotus 1-2-3 Style When typing a formula that begins with a function, you can precede the function name with the @ symbol instead of an equal sign and Microsoft Excel will automatically convert the @ to an equal sign when you click the enter box or press ENTER to enter the formula.

Matching Parentheses Microsoft Excel shows you the matching left parenthesis when you type a right parenthesis in the formula bar so you can make sure you have the correct number of parentheses in a formula. When you move the insertion point past a parenthesis, Microsoft Excel temporarily displays the parenthesis and its matching parenthesis in bold format.

MORE ABOUT

Scrolling to the Function You Want To scroll directly to the section of the Formula Paste Function list that begins with the first letter of the function you want, just press the letter for that key

Troubleshooting

Function Remains Lowercase If Microsoft Excel does not convert a function name to uppercase when you enter the formula, the function is not valid and you should check for typing errors. Retype the name of the function or use the Formula Paste Function command to insert the function into your formula.

Error Messages If Microsoft Excel displays a message saying there is an error in your function or formula, make sure that:

- All your parentheses match.
- All the required arguments are included in the required order and data types. If you omit an argument, type a comma as a placeholder.

Cannot Find a Function in the Microsoft Excel Function Reference If a function is listed in the Formula Paste Function dialog box but not in the *Microsoft Excel Function Reference*, then it is a custom function.

Saving a Worksheet

When you finish a session with Microsoft Excel, save your worksheet before you close it. You should also save periodically while you work so you don't lose your work in the event of a power interruption or hardware problem.

There are two commands you can use to save a worksheet—File Save and File Save As. Choosing the File Save command saves your worksheet under the same name with which it was last saved, replacing the previously saved version of the worksheet. If you choose the File Save As command, you can save a worksheet under a new name, in a different file format, in a different folder, or on another disk. With File Save As, you can also create a backup file, designate the worksheet as a template, or add passwords to a worksheet to protect it from being opened or changed. Microsoft Excel does not close a worksheet when you save it, so you can continue to work on it after saving it.

NOTE If a worksheet has never been saved before, choosing either the File Save or File Save As command displays the File Save As dialog box so you can specify a name for the worksheet file.

For information on	See
Closing a worksheet window	"Closing a Worksheet Window" following in this chapter
Saving a chart	"Saving a Chart" in Chapter 11
Protecting documents and specified worksheet cells with passwords	"Protecting Documents and Windows" in Chapter 16
Creating document templates	"Creating and Using a Document Template" in Chapter 16
Working with files from other applications	"Exchanging Documents with Other Applications" in Chapter 8
Saving linked worksheets	"Linking Documents" in Chapter 8

Online Help also provides information on saving a worksheet. To display online Help, choose the Window Help command. If you are using system software version 7.0 and the Help command does not appear on the Window menu, display Help by pointing to the Help menu icon and choosing the Microsoft Excel Help command. For information on a specific command, select the Commands topic. For information on using online Help, see "Using Help" in Chapter 1.

Saving a New or Existing Worksheet

If you're saving a worksheet for the first time or if you want to save an existing worksheet under a new name, in a different folder, or on a different disk, you use the File Save As command.

When you want to quickly save a worksheet that has already been saved and you want to save it under the same name and in the same folder, you use the File Save command. Choosing File Save immediately saves the worksheet on the disk without first displaying the File Save As dialog box.

IMPORTANT If your disk is almost full, canceling the File Save command, or the File Save As command after you choose the Save button, may interfere with the save process. To avoid possibly losing data, do not cancel the save process after it begins.

Saving a new or existing worksheet as a new worksheet file

If you are saving linked worksheets, make sure to save all supporting worksheets before you save the dependent worksheet, so that document names in external references are current. For information on linking and saving linked worksheets, see "Linking Documents" in Chapter 8.

1 Choose File Save As.

If the worksheet has never been saved before, you can also choose File Save. Microsoft Excel displays the File Save As dialog box and proposes the current name for the worksheet in the Save Worksheet As box.

2 If you want to save the worksheet under a different name from the one proposed, type the name for the worksheet.

For guidelines on naming files, see "More About Saving a Worksheet," later in this section.

3 To save the worksheet in a folder different from the one shown at the top of the dialog box, double-click the folder name in the list.

4 To save the worksheet on a different drive, choose the Drive button (or the Desktop button if you're using system software version 7.0).

For more information on changing drives and folders, see "More About Saving a Worksheet," later in this section.

5 Make sure that the correct file format is shown at the bottom of the dialog box.

For information on file formats, see "Saving a Worksheet in a Different File Format," later in this section.

6 Choose the Save button.

Saving an existing worksheet quickly under the same name

▶ Choose File Save.

Microsoft Excel replaces the previously saved version of the worksheet with the current version.

Creating a Backup File

You can set up your worksheet so that each time you save the worksheet in the future, Microsoft Excel saves the old version of the worksheet in a backup file. This way you can always keep the last two versions of a worksheet on your disk: the version you just saved and the previous version. Microsoft Excel maintains only one backup of the worksheet, which is always the version previous to the current version. To create the backup file, Microsoft Excel renames the old version by preceding the name with "Backup of" before saving the current version.

Creating an automatic backup file

1 Choose File Save As.

2 Choose the Options button.

3 Turn on the Create Backup File check box.

4 Choose OK.

5 Make any other changes to the filename, folder, or drive.

6 Choose the Save button.

Saving a Worksheet in a Different File Format

To make it easy to use your Microsoft Excel files with other applications, you can save your worksheet in many common formats. This lets you work with Microsoft Excel data in other applications or share Microsoft Excel data with people who use other applications. For more information on working with files from other applications, see "Exchanging Documents with Other Applications" in Chapter 8.

You can save your worksheet in one of the following file formats. The default format is Normal, the standard Microsoft Excel format. Note that Microsoft Excel displays the name of the file format currently selected in the lower-left corner of the File Save As dialog box.

IMPORTANT When you save a Microsoft Excel file in another file format, you may lose certain formatting that you have applied in Microsoft Excel if it is not supported by the file format you selected.

File format	Description
Normal	Standard format for a Microsoft Excel worksheet. Use this format if you are using the document with Microsoft Excel or if you plan to link worksheets.
Template	For saving Microsoft Excel templates.
Excel 2.2	For transferring files to Microsoft Excel version 2.2 or later. All graphic objects, including buttons, text boxes, and embedded charts are removed and cell border styles are replaced with single line borders. Although outline formatting is removed, the file still retains cell formats assigned with either outline styles or cell styles.
SYLK	Symbolic Link. For transferring data to another application, such as Microsoft Multiplan or Microsoft Excel for the Macintosh version 1.5 or earlier.
Text	ASCII text. Use this format for transferring data to a word processor. Saves only the text and values as they are displayed in the cells on the worksheet. Columns are separated by tabs, and rows by carriage returns, but all other format information is lost. If a cell contains a comma or a tab, the value from the cell is enclosed in double quotation marks.

File format	Description
CSV	Comma Separated Values (CSV) format is similar to Text format, except that CSV file format uses a comma to separate fields, instead of a tab. If a cell contains a comma, the value from the cell is enclosed in double quotation marks.
WKS	For transferring data to Lotus 1-2-3 Release 1 or Lotus Symphony.
WK1	For transferring data to Lotus 1-2-3 Release 2.
WK3	For transferring data to Lotus 1-2-3 Release 3.
DIF	For transferring data to VisiCalc. DIF stands for Data Interchange format.
DBF 2	For transferring the range named Database to dBASE II.
DBF 3	For transferring the range named Database to dBASE III.
DBF 4	For transferring the range named Database to dBASE IV.
Text (Windows)	For transferring data to a Windows application.
Text (OS/2 or DOS)	For transferring data to an OS/2 or DOS application.
CSV (Windows)	For transferring data to a Windows application.
CSV (OS/2 or DOS)	For transferring data to an OS/2 or DOS application.
Add-In	For saving Microsoft Excel add-in macros. This file format appears only when you're saving a macro sheet.
Int'l Macro	For saving macros so they can be run using any supported language version of Microsoft Excel. This file format appears only when you're saving a macro sheet.
Int'l Add-In	For saving Microsoft Excel add-in macros so they can be run using any supported language version of Microsoft Excel. This file format appears only when you're saving a macro sheet.

Saving a worksheet in a different file format

1 Choose File Save As.

2 Choose the Options button.

3 In the File Format box, select the format in which you want the file to be saved.

4 Choose OK.

5 Make any other changes to the filename, folder, or drive.

6 Choose the Save button.

MORE ABOUT

More About Saving a Worksheet

Guidelines

Naming a Worksheet To name a worksheet in Microsoft Excel, you follow the same rules that you use when naming any other file for the Macintosh. The filename can be a maximum of 31 characters.

Changing Disk Drives or Folders When you first choose the File Save As command, Microsoft Excel displays the name of the current drive in the upper-right corner of the File Save As dialog box and the the name of the current folder in a box at the top of the dialog box. The folders and files in the current folder are listed in a box below the name of the current folder. To save a worksheet in a folder in the current folder, double-click the folder name in the list. The folders and files in the folder you double-clicked are then listed in the box. To save a worksheet in a higher-level folder above the current folder, point to the current folder name at the top of the dialog box and drag down to select the folder you want. To save a worksheet in a folder on another drive, choose the Drive button (or the Desktop button, if you are using system software version 7.0).

Protecting a Worksheet or Worksheet Cell Contents with a Password When you want to prevent unauthorized users from opening or saving changes to a worksheet, you use the File Save As command to assign a password to a worksheet. You can assign two types of passwords: protection and write reservation. If you assign a *protection password*, Microsoft Excel does not open the worksheet until you enter the password. While you can open any linked worksheets to read data from the worksheet, you must enter the protected worksheet's password to update data in linked worksheets.

If you assign a *write reservation password*, anyone can open the worksheet, but only those who know the password can save changes to the document.

Using a password to protect a worksheet from being opened is different from using a password to protect specific worksheet cells—such as cells containing formulas—from changes.

For more information and procedures on using a password to protect documents or specified worksheet cells from being opened or changed, see "Protecting Documents and Windows" in Chapter 16.

MORE ABOUT

Saving Linked Worksheets If you're saving linked worksheets, make sure you save all supporting worksheets before you save the dependent worksheet, so that document names in external references are current. For information on linking and saving linked worksheets, see "Linking Documents" in Chapter 8.

Tips

Checking the Size of Your Worksheet If you are concerned about how much memory or disk space your worksheet is using, you can check the size of your worksheet by selecting the last cell in the worksheet. The last cell marks the extent of the worksheet area that is saved when you save the worksheet; Microsoft Excel ignores the unused rows below and columns to the right of the last cell. To select the last cell, choose the Formula Select Special command and select the Last Cell option. You can also press COMMAND+END to check the location of the last cell.

Saving Memory To make the most efficient use of your computer's memory, you can follow these tips as you're designing and creating your worksheets:

- When you enter data, you should try to enter the data in small rectangular areas. Because Microsoft Excel allocates memory by rows, you can save memory by building your worksheet down (in columns) instead of across (in rows). Remember that you can check the location of the lower-right cell by either choosing the Formula Select Special command and selecting the Last Cell option or by pressing COMMAND+END.
- Values use less memory than formulas. If you can use static values instead of formulas, convert the formulas to values. To do this, choose the Edit Copy command, and then choose the Edit Paste Special command. In the Edit Paste Special dialog box, select the Values option and choose OK.
- When entering a reference to a range, try to use entire rows or columns instead of a large range as the reference. For example, if you use the reference D2:D16384, Microsoft Excel allocates memory for every row from 2 to 16384. The reference D:D is a lot more efficient because Microsoft Excel allocates only one cell.
- When formatting cells, try not to format blank cells. For example, instead of formatting the first 100 rows with a number format when you need only 20, apply the format you want to either only the numbers that need the formatting or to the entire columns.
- Instead of adding multiple blank rows and columns to make rows taller and columns wider, you can use the Format Row Height command to increase the height of existing rows and the Format Column Width command to increase the width of existing columns.

MORE ABOUT

- When you want to add text to numbers, such as "lb" for pounds, create a custom number format to do this instead of copying the text "lb" into an adjacent column. For information on creating a custom number format, see "Formatting Worksheet Data" in Chapter 5.
- When you create a formula, use the Formula Define Name command to give the formula a name and then use the name in your worksheet. For information on using names, see "Naming Cells and Formulas" in Chapter 6.
- If possible, use array formulas instead of multiple formulas. For information on array formulas, see "Creating and Using an Array Formula" in Chapter 7.
- Instead of working in a large worksheet, divide the worksheet into several smaller worksheets and link them together. For information on linking worksheets, see "Linking Documents" in Chapter 8.
- If you're using imported Lotus 1-2-3 files that contain borders created by using characters such as hyphens or equal signs, first delete these characters and then use the Format Border command to apply the borders you want to the selected cells.

Picking Up Where You Left Off If you want to keep your current arrangement of open windows so you can quickly restore it in the future, you can do so by saving your workspace with the File Save Workspace command. Saving the workspace saves a list of the currently open documents and their shape and location in a *workspace file*.

When you save the workspace, Microsoft Excel asks if you want to save changes for each open document that has been changed since it was last saved. If you choose the Yes button, Microsoft Excel saves the changes on the disk and replaces the last saved version of the document, just as if you had chosen the File Save command for the document. When you start another Microsoft Excel work session and want to restore your workspace so you can pick up where you left off, just open the workspace file with the File Open command. All documents that were open when you saved the workspace are automatically opened when you open the workspace file. For more information on saving and restoring a workspace, see "Setting Up a Workspace" in Chapter 16.

Save Before You Delete It is also a good idea to save a worksheet before performing a major or lengthy operation so you can easily restore the worksheet to its previous state in case you make an error. For example, if you want to delete records from a database you have created on a worksheet, you should save the worksheet before choosing the Data Delete command to delete specific records. Because the Data Delete command permanently deletes records, you can't use the Edit Undo command to restore the deleted records. If you inadvertently delete records you didn't want to delete, you can still close the worksheet without saving the changes, and then use the File Open command to open the original worksheet.

Closing a Worksheet Window

Closing a worksheet means closing the window or multiple windows displaying the worksheet and removing the worksheet from the workspace. You can close a worksheet window at any time.

You also display charts and macro sheets in windows. Therefore, the procedures for closing a worksheet window also apply to charts and macro sheets.

For information on	See
Using Windows	"Working with Windows" in Chapter 1 and "Changing How Your Worksheet Is Displayed" in Chapter 5
Saving your worksheet	"Saving a Worksheet" earlier in this chapter
Deleting your worksheet	"Deleting a Worksheet" later in this chapter

Online Help also provides information on closing a worksheet window. To display online Help, choose the Window Help command. If you are using system software version 7.0 and the Help command does not appear on the Window menu, display Help by pointing to the Help menu icon and choosing the Microsoft Excel Help command. For information on a specific command, select the Commands topic. For information on using online Help, see "Using Help" in Chapter 1.

NOTE Any time you close a worksheet before saving changes, Microsoft Excel displays a message asking if you want to save changes. Choose the Yes button to save changes, the No button to cancel changes to the worksheet, or the Cancel button to cancel the command.

Closing a worksheet window

▶ Choose File Close or click the close box in the upper-left corner of the document title bar.

Closing all open worksheets

1 Hold down SHIFT and select the File menu.

This displays the File Close All command instead of the File Close command.

2 Choose File Close All.

Deleting a Worksheet

When you need to delete a worksheet from a disk, you don't have to quit Microsoft Excel. You can delete worksheets, macro sheets, charts, or any other file on your disk from within Microsoft Excel using the File Delete command.

NOTE You cannot use the File Delete command to delete a Microsoft Excel document that has been protected or write reserved with the File Save As command.

For information on	See
Deleting data in worksheet cells or deleting rows and columns	"Clearing and Deleting Cells, Rows, and Columns" in Chapter 4

Online Help also provides information on deleting a worksheet. To display online Help, choose the Window Help command. If you are using system software version 7.0 and the Help command does not appear on the Window menu, display Help by pointing to the Help menu icon and choosing the Microsoft Excel Help command. For information on a specific command, select the Commands topic. For information on using online Help, see "Using Help" in Chapter 1.

Deleting a worksheet

The following procedure also works for macro sheets, charts, and any other file on your disk.

IMPORTANT The File Delete command cannot be reversed with the Edit Undo command. If you delete a document from your disk, you cannot retrieve it. However, File Delete removes the document from the disk, but not from memory. If you inadvertently delete a document that is open, you can save it on your disk again with the File Save As command because the document is still in memory.

To do this procedure, you must be using full menus.

1. Choose File Delete.
2. In the list, select the worksheet you want to delete.

   If the worksheet you want to delete is not listed, switch to the folder containing the worksheet by double-clicking the folder name in the list. For more information on changing drives and folders, see "More About Deleting a Worksheet," later in this section.
3. Choose the Delete button.

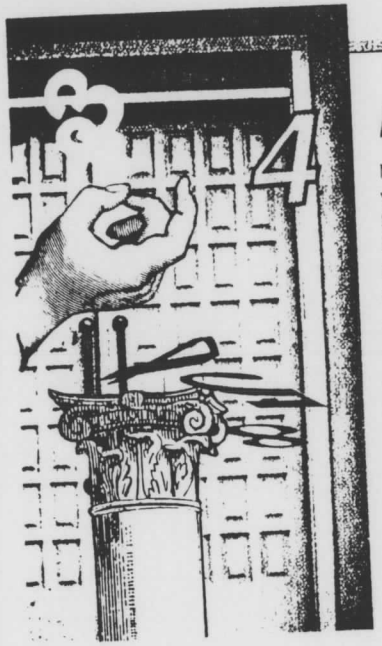
   Microsoft Excel asks for confirmation before deleting the worksheet. After you delete a worksheet, the File Delete dialog box remains open so you can select and delete other worksheets.
4. Choose the Close button to close the dialog box.

MORE ABOUT

More About Deleting a Worksheet

Guideline

Changing Disk Drives or Folders When you first choose the File Delete command, Microsoft Excel displays the name of the current drive in the upper-right corner of the File Delete dialog box and the the name of the current folder in a box at the top of the dialog box. The folders and files in the current folder are listed in a box below the name of the current folder. To delete a worksheet from a folder in the current folder, double-click the folder name in the list. The folders and files in the folder you double-clicked are then listed in the box. To delete a worksheet from a higher-level folder above the current folder, point to the current folder name at the top of the dialog box and drag down to select the folder you want. To delete a worksheet from a folder on another drive, choose the Drive button (or the Desktop button, if you are using system software version 7.0).



Editing a Worksheet

Microsoft Excel provides many commands to make editing your worksheet simpler and faster. You can copy or move data and formats from one location to another on the same worksheet or from one worksheet to another, insert and delete data, find and replace data, and sort rows and columns.

While editing your worksheet, keep in mind that you can undo or repeat most editing actions and commands by choosing the Edit Undo command or the Edit Repeat command immediately after performing an action or choosing a command.

NOTE Unless otherwise noted, all information and procedures for working with worksheets also apply to macro sheets.

Table of Contents

Moving and Copying Data and Formats ... 141

Inserting Cells, Rows, and Columns ... 158

Clearing and Deleting Cells, Rows, and Columns ... 159

Finding and Replacing Cells and Data ... 161

Sorting Data ... 171

Moving and Copying Data and Formats

With Microsoft Excel you can move or copy cell contents, notes, and formats to simplify editing tasks and streamline worksheet construction. You can move or copy cells to a different part of the same worksheet, to another worksheet, or to any other application that can read data from the Clipboard. If you move cells, Microsoft Excel automatically adjusts relative references to the moved cells so your formulas still work. If you copy cells, the original cells are not affected.

When you move or copy cells, Microsoft Excel uses the Clipboard to temporarily store the cells before you paste them into their new location. This section assumes you are familiar with Clipboard operations. If you are not, read your system documentation to learn about the Clipboard.

You can also copy data from a worksheet to a chart, or paste a copy of a formula on another worksheet as a link. A linked formula refers to the cells on the worksheet from which you copied the formula instead of cells on the same worksheet as the pasted formula. This section does not discuss copying data from a worksheet to a chart, pasting a formula as a link, or copying data between Microsoft Excel and other applications.

For information on	See
Copying data to a chart	"Adding, Editing, and Deleting Chart Data" in Chapter 12
Copying linked formulas to another worksheet	"Linking Documents" in Chapter 8
Copying data to another application	"Exchanging Documents with Other Applications" in Chapter 8

Online Help also provides information on moving and copying data and formats. To display online Help, choose the Window Help command. If you are using system software version 7.0 and the Help command does not appear on the Window menu, display Help by pointing to the Help menu icon and choosing the Microsoft Excel Help command. For information on a specific command, select the Commands topic. For information on using online Help, see "Using Help" in Chapter 1.

Moving Cells

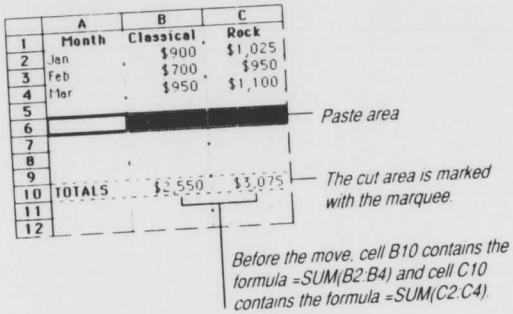
Moving cells is like physically cutting out the cells and transferring them to a new location—either on the same worksheet or on a different worksheet. Moving cells is a two-stage process. First, you select the cell or cells you want to move and choose the Edit Cut command to designate the selected area as the *cut area*; then, you select the area that you want to move the cells to and choose the Edit Paste command. When you choose Edit Cut, Microsoft Excel surrounds the cut area with a dotted line, called the *marquee*.

The area that you move the cells to is called the *paste area*. You can designate the paste area by selecting a single cell or by selecting an area the same size and shape as your cut area. If you select a single cell, Microsoft Excel uses this cell as the upper-left corner of the paste area and automatically expands the paste area down and to the right to match the size and shape of the cut area. Selecting a single cell is the easiest way to select the paste area. If you select a range of cells for the paste area, the selection must be the same size and shape as your cut area. Otherwise, Microsoft Excel will not complete the paste operation.

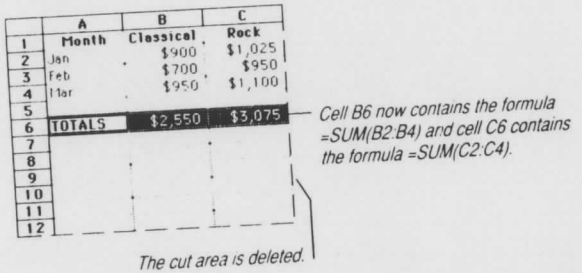
IMPORTANT When you choose the Edit Paste command, Microsoft Excel replaces the cells in the paste area with the cut cells, deleting the data that was contained in the paste area before the paste. If you're moving cells to a new location in the same rows or columns on the same worksheet, you can insert the cut cells between cells instead of pasting over the cells in the paste area by using the Edit Insert Paste command.

When you move cells, Microsoft Excel moves the cell contents, the cell formats, and any notes attached to the cell. Moved cells still refer to the same cells as they did before the move. Also, Microsoft Excel adjusts all references to the moved cells to reflect their new location, so formulas still use the same values from the new location. Cells that refer to the original paste area before the move produce error values because the original paste area is deleted once you paste.

The following example shows the monthly sales figures for a music store. The first illustration shows the worksheet before moving cells A10:C10:



After moving cells A10:C10 to A6:C6, the worksheet looks like this:



For more information on how references are adjusted, see "More About Moving and Copying Data and Formats," later in this section.

Moving cells

Use the following procedure to move cells and paste them over existing cells.

1. Select the cell or cells you want to move.
2. Choose Edit Cut.

   Microsoft Excel surrounds the selection with the marquee.
3. If you want to move the cells to another worksheet, activate the other worksheet.
4. Select the upper-left cell of the paste area—the cells you want to move the data to—or select the entire paste area.

   You can overlap the cut area and paste area.
5. Choose Edit Paste.

Inserting cut cells between existing cells

You can use the Edit Insert Paste command to insert cut cells between other cells when moving cells to a new location in the same rows or columns on the same worksheet. Use the following procedure to paste cut cells without replacing data in the existing cells and close up the cut area.

1. Select the cell or cells you want to move.
2. Choose Edit Cut.

   Microsoft Excel surrounds the selection with the marquee.
3. Select the cell where you want to insert the cut cells.
4. Choose Edit Insert Paste to insert the cut cells and shift the other cells down or to the right to accommodate the inserted cells.

Copying Cells

Copying cells is like physically duplicating the cells and pasting them into another location—either on the same worksheet or on a different worksheet. As with moving cells, copying cells is a two-stage process. First, you select the area you want to copy and choose the Edit Copy command to designate the selection as the *copy area*; then, you select the area where you want to place the copy and choose the Edit Paste command. When you choose Edit Copy, Microsoft Excel surrounds the copy area with a dotted line, called the *marquee*. This marquee remains around the copy area after you paste a copy of the cells, so you can paste the same cells again.

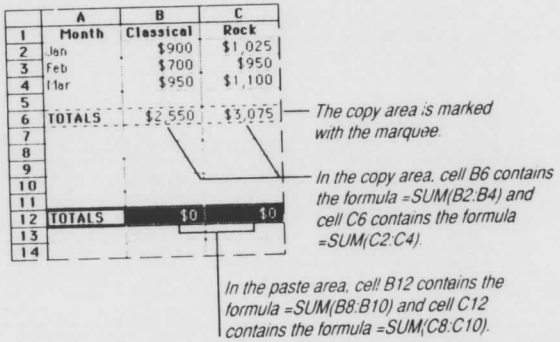
IMPORTANT When you choose the Edit Paste command, Microsoft Excel replaces the cells in the paste area with the copied cells, deleting the data that was contained in the paste area before the paste. You can insert the copied cells between cells instead of pasting over the cells in the paste area by using the Edit Insert Paste command.

When you copy cells, Microsoft Excel copies the cell contents, the cell formats, and any notes attached to the cell. You can choose to paste all or only one of these attributes into the new location, or *paste area*, using the Edit Paste Special command.

You designate the paste area in the same way that you do when you are moving cells. You select either a single cell to designate the upper-left corner of the paste area or you select an area the same size and shape as your copy area.

When you copy cells, Microsoft Excel automatically adjusts relative references in the paste area. The relative references refer to cells relative to the paste area instead of to cells relative to the original copied cells. Therefore, the pasted cells refer to different cells than do the cells you copied. For example, if cell B5 contains a relative reference to cell B1 and you copy cell B5 to C5, cell C5 contains the reference C1 instead of B1.

The following worksheet shows the result of copying cells A6:C6 to cells A12:C12:


A
B
C
1 Month Classical Rock
2 Jan $900 $1,025
3 Feb $700 $950
4 Mar $950 $1,100
6 TOTALS $2,550 $3,075
12 TOTALS $0 $0
The copy area is marked with the marquee.
In the copy area, cell B6 contains the formula =SUM(B2:B4) and cell C6 contains the formula =SUM(C2:C4).
In the paste area, cell B12 contains the formula =SUM(B8:B10) and cell C12 contains the formula =SUM(C8:C10).

For more information on how references are adjusted, see "More About Moving and Copying Data and Formats," later in this section.

NOTE To create a formula that refers to the same cells after you copy it, use absolute references in the formula. For example, use the reference $B$1 instead of B1.

Copying and pasting cells

Use the following procedure to copy cells and paste them over existing cells.

1. Select the cell or cells you want to copy.
2. Choose Edit Copy.

   Microsoft Excel surrounds the selection with the marquee.
3. To copy the cells to another worksheet, activate the other worksheet.
4. Select the upper-left cell of the paste area—the cells you want to copy to—or select the entire paste area.
5. Choose Edit Paste.
6. To copy the same cells to another location, repeat steps 3 through 5 with a different paste area.
7. To cancel the marquee after you have finished copying, choose a command, activate the formula bar, or press COMMAND+PERIOD.

NOTE If you know that you want to paste the copied cells only once, you can press ENTER on the numeric keypad at step 5 instead of choosing a command. This completes the procedure.

Inserting copied cells between existing cells

You can use the Edit Insert Paste command to insert copied cells between other cells. Use the following procedure to paste copied cells without replacing data in the existing cells.

1. Select the cell or cells you want to copy.
2. Choose Edit Copy.

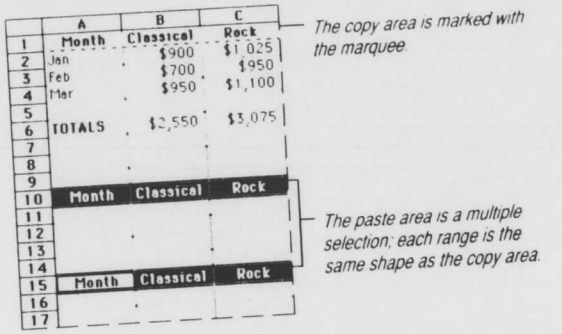
   Microsoft Excel surrounds the selection with the marquee.
3. To copy the cells to another worksheet, activate the other worksheet.
4. Select the upper-left cell of where you want to insert the copied cells.
5. Choose Edit Insert Paste.

   Microsoft Excel displays a dialog box so you can choose which way you want to shift the original cells.
6. Select the Shift Cells Right option to shift the cells in the paste area right, or select the Shift Cells Down option to shift the cells in the paste area down.

NOTE You can use the Edit Insert Paste command only once during copying. To copy and insert cells again, repeat the preceding procedure. If you want to paste the same cells over existing cells, you can choose the Edit Paste command without repeating the procedure because the marquee is still in effect. To cancel the marquee, choose a command, activate the formula bar, or press COMMAND+PERIOD.

Pasting Multiple Copies with One Paste Operation

You can copy the same cell or range to many areas of a worksheet in one operation. To do this, you make a multiple selection for the paste area.



To make a multiple selection, drag through the first selection, and then hold down COMMAND as you drag through each additional selection.

If you have a keyboard with function keys, you can also make a multiple selection with the keyboard. Hold down SHIFT and press a movement key to extend the selection to include the cells you want. Then press SHIFT+F8 to turn on Add To Selection mode and keep that selection, and move to the first cell of the next range you want to select. Repeat this sequence to add selections.

For more information on selecting, see "Selecting Cells and Moving Around the Worksheet" in Chapter 3.

You can also duplicate the copy area many times within one paste area. To do this, you select a paste area made up of multiple rectangles the same shape as the copy area. In the preceding illustration, for example, selecting cells A10:C12 for the paste area would paste the copied cells in the paste area three times.

You can combine these two techniques to copy the same cell range to multiple areas on the worksheet and paste multiple copies in each range of the multiple selection. To do this, make up each paste area of multiple rectangles the same size and shape as the copy area.

NOTE The Edit Insert Paste command cannot be used to paste multiple copies of a cell or range.

Copying and pasting multiple copies of the same cells

1. Select the cell or cells you want to copy.
2. Choose Edit Copy.
3. To paste the same cells in many areas of the worksheet, select the upper-left cell of each paste area. Alternately, you can select multiple paste areas the same shape as the copy area.

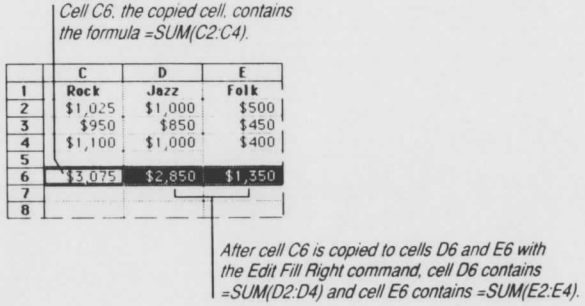
   To duplicate the copy area many times within a paste area, select a paste area made up of multiple rectangles of the same size and shape as the copy area.
4. Choose Edit Paste.
5. To paste the same copy area again, repeat steps 3 and 4.
6. To cancel the marquee after you have finished copying, choose a command, activate the formula bar, or press COMMAND+PERIOD.

NOTE If you know that you want to paste the copied cells only once, you can press ENTER on the numeric keypad at step 4 instead of choosing a command. This completes the procedure.

Copying to a Range of Adjacent Cells

If you want to copy the same formulas or data to several adjacent cells, you can use the Edit Fill commands as a shortcut. The Edit Fill commands copy cells from one row or column in a selection into the adjacent cells of the selection. If you have a workgroup selected, you can also use the Edit Fill Workgroup command to copy the selection on the active worksheet to the same location on all the other worksheets in the group. For more information on editing with a workgroup selected, see "Editing Worksheets as a Group" in Chapter 8.

The following illustration shows how you could fill in the total formulas for a row from one cell on the left:


Cell C6, the copied cell, contains the formula =SUM(C2:C4).
C
D
E
1 Rock Jazz Folk
2 $1,025 $1,000 $500
3 $950 $850 $450
4 $1,100 $1,000 $400
5
6 $3,075 $2,850 $1,350
7
8
After cell C6 is copied to cells D6 and E6 with the Edit Fill Right command, cell D6 contains =SUM(D2:D4) and cell E6 contains =SUM(E2:E4).

Filling a selection

1. Select the cell or cells you want to copy and the adjacent cells you want to fill.

   You can make a multiple selection; in this case, each range in the selection is filled from the cells in the same range.
2. To copy the selection's first column into the adjacent cells to the right, choose Edit Fill Right.

   To copy the selection's first row to the adjacent cells below, choose Edit Fill Down.

   To copy the selection's last column into the adjacent cells to the left, choose Edit Fill Left (hold down SHIFT as you select the Edit menu).

   To copy the selection's last row into the adjacent cells above, choose Edit Fill Up (hold down SHIFT as you select the Edit menu).

Moving or Copying in the Formula Bar

As a time-saver when you're creating long formulas or labels, you can use the Edit Copy, Edit Cut, and Edit Paste commands while the formula bar is active. This is useful for moving characters in the formula bar or quickly copying repeated characters, such as references or names, to different locations in the same formula or to formulas in other cells.

Moving or copying characters in the formula bar

1. Select the cell containing the characters you want to move or copy.
2. In the formula bar, select the characters you want to move or copy.
3. To move the selection, choose Edit Cut.

   To copy the selection, choose Edit Copy.
4. To move or copy the characters to another cell, press ENTER and then select the cell into which you want to paste the characters.
5. To insert the cut or copied characters, position the insertion point in the formula bar where you want to paste the characters.

   To replace characters in the formula bar with the copied or cut characters, select the characters you want to replace in the formula bar.
6. Choose Edit Paste.

Copying Only a Cell's Formula, Value, Format, or Note

Normally, when you copy cells to a new location, Microsoft Excel copies and pastes formulas, values, formats, and notes. To paste only one of these attributes, use the Edit Paste Special command when you paste the copied cells. For example, if you paste only the copied cells' formats, Microsoft Excel reformats the cells in the paste area to match the copied cells' formats but does not change the contents of the cells in the paste area.

Copying specific cell attributes

To do this procedure, you must be using full menus.

1. Select the cells you want to copy.
2. Choose Edit Copy.
3. Select the paste area.
4. Choose Edit Paste Special.
5. To paste only the contents of the copied cells (as entered in the formula bar), and not cell notes or formats, select the Formulas option.

   To paste only the copied values (as displayed in the cells), select the Values option.

   To paste only the copied formats, select the Formats option.

   To paste only the notes attached to the copied cells, select the Notes option.
6. Choose OK.

Combining the Contents of the Copy and Paste Areas

Instead of replacing the values or formulas in the paste area with those in the copy area, you can combine the formulas or values in the copied cells with the formulas or values in the paste area cells. You can specify whether the copied formulas or values are added to, subtracted from, multiplied by, or divided into the contents of the paste area cells.

If you combine formulas from a copied cell and a paste area cell, the copied formula is appended to the paste area cell's formula, each formula is enclosed in parentheses, and the two formulas are joined by the operator for the operation you selected (add, subtract, multiply, or divide). If the paste area cell contains a formula and you paste the value of the copied cell into it, the original formula is enclosed in parentheses and the copied value is appended to the formula, preceded by the appropriate operator. If the copied cell and paste area cell both contain values, then the resulting value from the operation is entered in the paste area cell, not a formula showing the combination of the two cells.

This procedure is useful for combining formulas or values already on the worksheet to build additional formulas, as shown in the following illustrations:

	A	B	C	D	E	F
1	Month	Classical	Rock	Jazz	Folk	Total Sales
2	Jan	$900	$1,025	$1,000	$500	$3,425
3	Feb	$700	$950	$850	$450	$2,950
4	Mar	$950	$1,100	$1,000	$400	$3,450
5						
6	TOTALS	$2,550	$3,075	$2,850	$1,350	$9,825
7						
8						
9						
10	YTD	Classical	Rock	Jazz	Folk	Ad to Sales $
11	Advertising	$150	$525	$375	$100	$1,150.00
12						
13						

Cell F11, the paste area, contains the formula =SUM(B11:E11) before the paste.

Cell F6 is selected as the copy area.

	A	B	C	D	E	F
1	Month	Classical	Rock	Jazz	Folk	Total Sales
2	Jan	$900	$1,025	$1,000	$500	$3,425
3	Feb	$700	$950	$850	$450	$2,950
4	Mar	$950	$1,100	$1,000	$400	$3,450
5						
6	TOTALS	$2,550	$3,075	$2,850	$1,350	$9,825
7						
8						
9						
10	YTD	Classical	Rock	Jazz	Folk	Ad to Sales $
11	Advertising	$150	$525	$375	$100	$0.12
12						
13						

Selecting the Values and Divide options in the Edit Paste Special dialog box appends the value in cell F6 to the formula in the paste area. Cell F11 now contains the formula =(SUM(B11:E11))/9825.

Combining copied formulas or values with the paste area

To do this procedure, you must be using full menus.

1. Select the cell or cells you want to copy.
2. Choose Edit Copy.
3. Select the paste area.
4. Choose Edit Paste Special.

5 To combine the copied cells' formulas with the paste area cells, select the Formulas option.

To combine the copied cells' values with the paste area cells, select the Values option.

6 Under Operation, select the operation you want used to combine each copied cell and its corresponding paste area cell.

If you select the Divide option, Microsoft Excel divides the paste area cell value or formula by the copied cell value or formula. If you select the Subtract option, Microsoft Excel subtracts the copied cell value or formula from the paste area cell value or formula.

7 Choose OK.

NOTE When combining data from more than one worksheet, you can also use the procedures for linking cells or ranges between worksheets. For information on linking, see "Linking Documents" in Chapter 8.

Transposing the Copied Cells When You Paste

You can transpose or switch the arrangement of the copied rows and columns in the paste area. For example, if the data in the copy area is originally arranged in columns, Microsoft Excel pastes the data in rows, as shown in the following illustration:

	A	B	C	D
1	Month	Classical	Rock	
2	Jan	$900	$1,025	
3	Feb	$700	$950	
4	Mar	$950	$1,100	
5				
6	TOTALS	$2,550	$3,075	
7				
8				
9	Month	Jan	Feb	Mar
10	Classical	$900	$700	$950
11	Rock	$1,025	$950	$1,100
12				
13				

In the copy area, the months are in a column and the categories are in a row.

The Transpose check box in the Edit Paste Special dialog box switches the rows and columns in the paste area.

Transposing copied rows and columns in the paste area

To do this procedure, you must be using full menus.

1 Select the cells you want to copy.

2 Choose Edit Copy.

3 Select the paste area.

Selecting a single cell is easiest, since it may be difficult to determine the size and shape of the transposed copy area.

4 Choose Edit Paste Special.

5 Turn on the Transpose check box.

6 Choose OK.

Copying Only Nonblank Cells or Visible Cells

With the Edit Paste Special command, you can choose to paste only the nonblank cells from the copy area. If you paste only nonblank cells, blank cells in the copy area do not replace cells in the paste area. If you do not tell Microsoft Excel to paste only nonblank cells, blank cells in the copy area replace cells in the paste area, effectively clearing those cells.

Also, if you are copying cells from an area that contains collapsed rows or columns due to outlining, you can use the Formula Select Special command to paste only the cells that were visible when you selected the copy area. This is useful for copying summary data to another area of the same worksheet or to another worksheet to create a summary report.

Pasting only nonblank cells

To do this procedure, you must be using full menus.

1 Select the cells you want to copy.

2 Choose Edit Copy.

3 Select the paste area.

4 Choose Edit Paste Special.

5 Turn on the Skip Blanks check box.

6 Choose OK.

Pasting only visible cells

To do this procedure, you must be using full menus.

1 Select the cells you want to copy.

2 Choose Formula Select Special or click the select visible cells button in the tool bar ( ).

3 If you chose Formula Select Special, select the Visible Cells Only option.

4 Choose Edit Copy.

5 Select the paste area.

6 Choose Edit Paste.

NOTE If the paste area contains collapsed rows or columns, Microsoft Excel pastes the copy area into consecutive rows or columns even if they are not visible. You may need to expand the paste area to see all of the copied cells.

MORE ABOUT

More About Moving and Copying Data and Formats

Guidelines

How Moving Cells Affects References Moving data has the following effects on references:

- Microsoft Excel automatically adjusts all references to the moved cells so the references designate the same cells in the new location (the paste area); therefore, all formulas are still calculated from the same values.
- In the moved cells, Microsoft Excel does not change references to cells outside the moved cells. After you move formulas, the formulas in the paste area refer to the same cells that they did before you moved them. References to cells within the paste area are adjusted as noted previously.
- Formulas referring to the paste area (as it exists before you paste in the moved cells) produce the #REF! error value since you are effectively deleting the area by pasting the moved cells over it.
- Outside the cut area, references to the cut area produce the #REF! error value if you move the cut cells to another worksheet.

Each of the next two illustrations shows formulas before and after one of the cells is moved. In the following illustration, cell B7 is moved to cell B5. Notice that references within the moved cell (cell B7) don't change when the cell is moved, but that Microsoft Excel does adjust references to the moved cell.

Before the move, cell B7 contained the formula =SUM(B2:B4). After the move to cell B5, the formula still refers to B2:B4.

	A	B	C
1	Month	Classical	Rock
2	Jan	$900	$1,025
3	Feb	$700	$950
4	Mar	$950	$1,100
5	TOTALS	$2,550	$3,075
6			
7			
8			
9			
10	Month	Classical	Rock
11	Apr	$975	$1,150
12	May	$875	$1,000
13	Jun	$950	$1,075
14			
15	TOTALS	$2,800	$3,225
16			
17	YTD	$5,350	$6,300
18			
19			

The selected cut area was cell B7.

Before the move, cell B17 contained the formula =B7+B15. After the move, Microsoft Excel adjusted the reference so cell B17 now contains the formula =B5+B15.

MORE ABOUT

Now look what happens when cell C15 is moved to cell B15:

	A	B	C
1	Month	Classical	Rock
2	Jan	$900	$1,025
3	Feb	$700	$950
4	Mar	$950	$1,100
5	TOTALS	$2,550	$3,075
6			
7			
8			
9			
10	Month	Classical	Rock
11	Apr	$975	$1,150
12	May	$875	$1,000
13	Jun	$950	$1,075
14			
15	TOTALS	$3,225	
16			
17	YTD	#REF!	$6,300
18			
19			

The moved cell, C15, contained the formula =SUM(C11:C13) before the move and still refers to C11:C13 after the move.

Before the move, cell B17 contained the formula =B5+B15. After the move, cell B17 shows an error value because one cell it originally referred to (B15) was pasted over (and so deleted).

How Copying Cells Affects References When you copy cells, Microsoft Excel automatically adjusts relative references and the relative parts of mixed references in the paste area.

For example, in the following illustration, the formula in cell B6—=SUM(B2:B4)—refers to a range of three cells above it. If you copy cell B6 and paste it in cell C6, Microsoft Excel changes the references so the formula still refers to the "second through fourth cells up from the formula cell."

	A	B	C
1	Month	Classical	Rock
2	Jan	$900	$1,025
3	Feb	$700	$950
4	Mar	$950	$1,100
5			
6	TOTALS	$2,550	$3,075
7			
8			

When the copied cell is pasted into cell C6, Microsoft Excel adjusts the references to refer to the cells above cell C6. Cell C6 contains the formula =SUM(C2:C4).

Cell B6, the copied cell, refers to the cells above it. Cell B6 contains the formula =SUM(B2:B4).

MORE ABOUT

When you copy relative or mixed references in the A1 reference style, the paste area references look different from those in the copy area because Microsoft Excel has adjusted them to refer to cells that are relative to the paste area.

Microsoft Excel makes the same type of adjustment when you use the R1C1 reference style. For example, using the R1C1 reference style in the preceding example, the formula in cell R6C2 (cell B6 in the illustration) would be =SUM(R[–4]C:R[–2]C). The [–4] and [–2] indicate that the references are relative. If you copy cell R6C2 to cell R6C3 (cell C6 in the illustration), Microsoft Excel does not change the references, so cell C6 also contains the formula =SUM(R[–4]C:R[–2]C), but the formula refers to cells in column C instead of column B. Thus, when you copy relative or mixed references in the R1C1 reference style, the paste area references look the same as those in the copy area, even though they refer to different cells.

To create a formula with references that refer to the same cells after you copy it, use absolute references in the formula.

For information on absolute, relative, and mixed references, see "Entering a Formula" in Chapter 3.

How Copying Cells Affects Named Cells and Ranges You can copy formulas containing names from one worksheet to another. If you copy a formula containing a name, and that name does not exist on the worksheet in which you are pasting the formula, Microsoft Excel defines the name on the destination worksheet. The name on the destination worksheet refers to the same cell range as the original name, except on the destination worksheet. For example, if the name "West_Region" refers to cells A5:A25 on a worksheet and you copy a formula containing the name "West_Region" from that worksheet to a second worksheet, Microsoft Excel adds the name "West_Region" to the second worksheet and defines it as cells A5:A25 on the second worksheet.

If a copied formula contains a name that is already defined on the worksheet in which you are pasting the formula, Microsoft Excel displays a message asking if you want to use the existing definition of the name. To use the definition on the active worksheet—the worksheet into which you are pasting the formula—choose Yes. To use the definition on the worksheet from which you are copying the formula, choose No. If you choose No, Microsoft Excel asks you to create a different name for the definition being copied from the original worksheet.

For example, you might have a worksheet named 1988, with the name Inflation defined as 4%, and a worksheet named 1980, where the name Inflation is defined as 13%. If you copy a formula containing a reference to Inflation from the 1980 worksheet to the 1988 worksheet, Microsoft Excel asks if you want to use the existing definition of Inflation in the 1988 worksheet. If you choose Yes, the formula uses the 4% inflation rate for calculations. If you choose No, the formula uses the 13% inflation rate, but Microsoft Excel asks you to rename it because Inflation cannot be defined as 4% and 13% at the same time.

MORE ABOUT

For more information on using named cells and ranges, see "Naming Cells and Formulas" in Chapter 6.

Tips

Filling a Selection with the Formula Bar Entry In addition to filling a range of cells using the Edit Fill commands, you can also fill a range of cells directly from the formula bar. Select the range of cells you want to fill and activate the formula bar. When you are finished typing or editing in the formula bar, press OPTION+RETURN. Microsoft Excel fills each cell in the selection with the formula bar entry. For more information on using the formula bar, see "Entering Worksheet Data" in Chapter 3.

Viewing Different Areas of a Worksheet at the Same Time If the paste area is too far away from the copy or cut area to display both in one window, you can still view both at once by opening a second window into the same worksheet or by splitting the window into two panes that you can scroll separately.

To open a new window into the same worksheet, choose the Window New Window command. You can then scroll the two windows separately to view different areas of the worksheet. Any changes you make in one window are automatically reflected in the other window.

To split a window, drag either the horizontal or vertical split box (the boxes in the scroll bar to the left of the left scroll arrow and above the up scroll arrow) to the position where you want the split; you can also choose the Control Split command in the document window and use the ARROW keys to position the split box. Once the window is split, you can scroll each portion of the window independently so you can view the paste area alongside the copy or cut area.

For more information on manipulating your worksheet window display, see "Changing How Your Worksheet Is Displayed" in Chapter 5.

Troubleshooting

Problems While Moving or Copying Cells If moving or copying cells causes formula errors or other problems, try the following:

- Immediately choose the Edit Undo Paste command to restore the worksheet as it was before the move or copy. This also restores error values such as #REF! that were caused by a move operation to their original references.
- To find out if a move operation produced error values, use the Formula Find command to find the cells with error values. After finding the error values, you can still undo the paste with the Edit Undo Paste command.

When Microsoft Excel Can't Paste with a Paste Area of a Single Cell If you select only the upper-left corner of the paste area and Microsoft Excel displays a message and does not paste the cells, the copy area is too big to fit in the paste area without extending beyond the edge of the worksheet. Select a paste area nearer the beginning of the worksheet or copy a smaller range of cells. If you cannot

paste in a different area or copy a smaller range, create a new worksheet and paste the cells in the new worksheet with the Edit Paste Link command. The formulas pasted in the new worksheet will still refer to cells on the original worksheet. For more information on pasting linked formulas, see "Linking Documents" in Chapter 8.

Inserting Cells, Rows, and Columns

After you have entered data on your worksheet, you may want to insert blank cells between occupied cells to make room for new data or to include more white space in the data area. You can insert individual blank cells, ranges of blank cells, or entire blank rows or columns anywhere on the worksheet. When you insert cells, Microsoft Excel shifts the other cells in your worksheet to make room for the inserted cells and adjusts references to the shifted cells to reflect their new locations.

When you insert cells, Microsoft Excel applies appropriate formats to the inserted cells whenever possible. Generally, this means the inserted cells are given the same formats as the cells around them.

For information on	See
Inserting data from the Clipboard	"Moving and Copying Data and Formats" earlier in this chapter

Online Help also provides information on inserting cells, rows, and columns. To display online Help, choose the Window Help command. If you are using system software version 7.0 and the Help command does not appear on the Window menu, display Help by pointing to the Help menu icon and choosing the Microsoft Excel Help command. For information on a specific command, select the Commands topic. For information on using online Help, see "Using Help" in Chapter 1.

Inserting blank cells

1 Select the area where you want blank cells inserted. To insert an entire row or column, select any cell in the row or column you want shifted to open space for the new row or column. To insert multiple rows or columns, extend the selection to include the same number of rows or columns you want to insert.

   If you are inserting partial rows and columns, the area you select should be the same size as the area of blank cells you want to insert.

2 Choose Edit Insert.

3 If you are inserting partial rows and columns, select Shift Cells Right or Shift Cells Down to shift the other cells in the worksheet to accommodate the inserted cells.

If you are inserting entire rows or columns, select Entire Row or Entire Column to shift the selected rows or columns down or to the right to open space for the new row or column.

4 Choose OK.

Microsoft Excel inserts blank cells and adjusts references to the shifted cells to reflect their new locations.

You can also insert blank rows or columns by selecting entire rows or columns and choosing the Edit Insert command. To select a row or column, click the row or column heading. With the keyboard, press SHIFT+SPACEBAR to select the current row or press COMMAND+SPACEBAR to select the current column.

NOTE When you insert partial rows or columns, you may inadvertently shift other cells on the worksheet so they are no longer lined up with their associated cells. For example, suppose you are inserting cells in column B, and further down the worksheet you have a list of clients in column A and their phone numbers in column B. If you shift column B cells down, you will find that the phone numbers are no longer next to the appropriate clients. To avoid this, select cells in every column or row containing data or insert entire rows or columns.

Clearing and Deleting Cells, Rows, and Columns

Clearing and *deleting* are two ways to remove data from a Microsoft Excel document. The distinction between the two techniques is very important for worksheets and macro sheets. Clearing a cell clears the contents, formats, or notes—or all three—from that cell, but leaves the cleared cell in the structure of the worksheet. Deleting a cell completely removes the cell and its notes from the worksheet, and closes up the space that was occupied by the deleted cell.

For information on	See
Deleting data from the formula bar	"Editing Worksheet Data" in Chapter 3
Deleting notes from the worksheet	"Adding Comments to a Worksheet" in Chapter 6
Deleting custom number formats	"Formatting Worksheet Data" in Chapter 5
Deleting cell styles from the style sheet	"Formatting with Cell Styles" in Chapter 5
Deleting worksheet names	"Naming Cells and Formulas" in Chapter 6
Deleting a worksheet	"Deleting a Worksheet" in Chapter 3

Online Help also provides information on clearing and deleting cells, rows, and columns. To display online Help, choose the Window Help command. If you are using system software version 7.0 and the Help command does not appear on the Window menu, display Help by pointing to the Help menu icon and choosing the Microsoft Excel Help command. For information on a specific command, select the Commands topic. For information on using online Help, see "Using Help" in Chapter 1.

Clearing vs. Deleting Cells

Clearing and deleting cells produce different results for formulas that reference those cells. If a cell is cleared, its value is zero; a formula referring to that cell will get a value of zero from that cell. If a cell is deleted, it no longer exists; a formula referring to the deleted cell will not be able to find it and will return the #REF! error value.

This difference can be very significant, because clearing a cell when you mean to delete it might produce erroneous data. For example, if you enter the formula =A1*B1 in a cell and then clear cell B1, the result of the formula will be zero (A1*0). If you delete cell B1, the cell containing the formula =A1*B1 is changed to =A1*#REF! and produces the #REF! error value to let you know that you need to adjust your formula.

NOTE You should always use caution when deleting cells. However, if you inadvertently delete cells you want to keep, you can put them back by immediately choosing the Edit Undo command before doing anything else on your worksheet.

Notes that are attached to deleted cells are deleted with the cells. Notes that belong to shifted cells follow the cells to their new locations.

Clearing cells' contents, formats, and notes

Use the Edit Clear command to clear a cell's contents, format, or note, or all three, but leave the cell in the worksheet. A cell's format includes number format, alignment, font, patterns, protection, and borders. Clearing the formats from a cell with a style other than Normal changes that cell's style to Normal and applies all formats that are part of the Normal style to the cell.

1. Select the cell or cells you want to clear.
2. Choose Edit Clear.
3. To clear formats, formulas, and notes from the selected cells, select the All option.

   To clear just the formats, select the Formats option.

   To clear just the formulas, select the Formulas option.

   To clear just the notes, select the Notes option.
4. Choose OK.

NOTE If you want to clear formulas, values, formats, and notes from an entire worksheet, it's easier to create a new worksheet using the File New command than to clear the cells using the Edit Clear command.

Deleting cells

Use the Edit Delete command to remove cells from the worksheet and close up the space occupied by the cells. Using Edit Delete does not place the cells on the Clipboard, which means that you cannot paste the cells after deleting them. To place the cells on the Clipboard so you can paste them in another location, use the Edit Cut command. For information on using Edit Cut, see "Moving and Copying Data and Formats," earlier in this chapter.

1. Select the cell or cell range you want to delete. To delete an entire row or column, select any cell in that row or column. To delete multiple rows or columns, extend the selection to include a cell in each row or column you want to delete.
2. Choose Edit Delete.
3. If you are deleting a cell or cell range, select Shift Cells Left or Shift Cells Up to shift the remaining cells and close the space left by the deleted cells.

   If you are deleting entire rows or columns, select Entire row or Entire Column to shift cells up or left and close the space left by the deleted rows or columns.
4. Choose OK.

   Microsoft Excel deletes the cells and shifts other cells in the worksheet to fill the space.

   You can also delete rows or columns by selecting entire rows or columns and choosing the Edit Delete command. To select a row or column, click the row or column heading. With the keyboard, press SHIFT+SPACEBAR to select the current row or press COMMAND+SPACEBAR to select the current column.

Finding and Replacing Cells and Data

When you want to select specific cells or find cells that contain specific data, you don't have to scroll through your worksheet browsing for the cells or data you want. You can use commands from the Formula menu to go directly to the desired location on the worksheet.

Using Formula menu commands, you can find cells that contain specific characters or you can find and select special cells, such as cells that differ from a comparison cell, or combinations of related cells, such as cells that contain error values. You can also automatically replace a sequence of characters with another sequence of characters in cells throughout the worksheet or a selection.

For information on	See
Finding records in a database	"Maintaining a Database with a Data Form" in Chapter 9 and "Finding Records" in Chapter 10

Online Help also provides information on finding and replacing cells and data. To display online Help, choose the Window Help command. If you are using system software version 7.0 and the Help command does not appear on the Window menu, display Help by pointing to the Help menu icon and choosing the Microsoft Excel Help command. For information on a specific command, select the Commands topic. For information on using online Help, see "Using Help" in Chapter 1.

Finding cells containing specific data

To find cells containing specific formulas, values, or any sequence of characters, use the Formula Find command. For example, you might want to find all cells that are formatted with a percent sign (%), contain the #REF! error value, or have formulas that contain the name Sales_1990 or the reference A1. You can search the entire worksheet or just a selected range.

1 To search the entire worksheet, select a single cell. Microsoft Excel starts the search at the cell you select.

   To limit the search, select the cell range you want to search.

2 Choose Formula Find.

3 In the Find What box, type the characters you want to find.

   To find a formula containing a multiplication operator (*), precede the asterisk with a tilde (~). If you type just an asterisk, Microsoft Excel treats it as a wildcard character. For information on wildcard characters, see "More About Finding and Replacing Cells and Data," later in this section.

4 To look in the formulas as displayed in the formula bar, select the Formulas option.

   To look in the formatted values as displayed in the cells, select the Values option.

   To look in the note text of the cells, select the Notes option.

5 To find only those cells whose entire formula, value, or note matches the characters you want to find, select the Whole option.

   To find all cells that contain the characters you want to find even if they are only part of the cell's formula, value, or note, select the Part option.

6 To search horizontally through rows, select the Rows option. Use this option if the cell you are looking for is probably to the left or right of the active cell.

   To search vertically through columns, select the Columns option. Use this option if the cell you are looking for is probably above or below the active cell.

7 To find only those cells that match the uppercase and lowercase characters exactly as you typed them in the Find What box, turn on the Match Case check box.

   When the Match Case check box is turned off, Microsoft Excel matches the characters regardless of capitalization.

8 To search forward from the active cell, choose OK.

   To search backward from the active cell, hold down SHIFT and choose OK.

9 To find the next occurrence of what you last specified, press F7.

   To find the previous occurrence, press SHIFT+F7.

   If your keyboard does not have function keys, press COMMAND+H to find the next occurrence and press COMMAND+SHIFT+H to find the previous occurrence.

Finding and replacing data

Use the Formula Replace command to find and replace a specific sequence of characters in cells with another sequence of characters. The Formula Replace command searches only the contents of cells, not cell notes or the values produced by formulas.

To do this procedure, you must be using full menus.

1 To search the entire worksheet, select a single cell. Microsoft Excel starts the search at the cell you select.

   To limit the search, select the cell range you want to search.

2 Choose Formula Replace.

3 In the Find What box, type the characters you want to find and replace.

4 In the Replace With box, type the characters that will replace what you typed in the Find What box.

5 To find only those cells whose entire contents match the characters you want to find, select the Whole option.

   To find all cells that contain the characters you want to find even if they are only part of the cell's contents, select the Part option.

6 To search horizontally through rows, select the Rows option.

   To search vertically through columns, select the Columns option.

7 To find only those cells that match the uppercase and lowercase characters exactly as you typed them in the Find What box, turn on the Match Case check box.

When the Match Case check box is turned off, Microsoft Excel matches the characters regardless of capitalization.

8 To replace data in the active cell and find the next occurrence, choose the Replace button. To search backward, hold down SHIFT and choose the Replace button.

To skip the active cell and find the next occurrence of the data, choose the Find Next button. To search backward, hold down SHIFT and choose the Find Next button.

To replace all occurrences of the data in the worksheet or the selection, choose the Replace All button. If only a single cell is selected, choosing the Replace All button replaces all occurrences in the entire worksheet.

9 To close the dialog box, choose the Close button.

Choosing the Close button does not reverse any replacements already made, but only closes the dialog box. To undo all replacements made, choose the Edit Undo Replace command immediately after closing the dialog box.

Finding cells with specific types of contents

To find and select all the cells in a selection or in the entire worksheet that contain a specific type of contents—notes, constants, formulas, or blanks—use the Formula Select Special command.

When you find cells that contain constants, you can specify whether Microsoft Excel finds cells that contain number constants, text, logical values, error values, or any combination of these. Constants are values that have been entered in cells and that don't start with an equal sign, rather than the results displayed by formulas in cells. When you find cells that contain formulas, you can specify whether Microsoft Excel finds cells containing formulas that produce numbers, text, logical values, error values, or any combination of these. Finding formulas that produce error values is useful for checking your worksheet. Also, finding blank cells is useful for finding cells that should contain data but don't, and are therefore causing formulas to produce misleading results.

To do this procedure, you must be using full menus.

1 To search the entire worksheet, select a single cell.

To limit the search, select the cell range you want to search.

2 Choose Formula Select Special.

3 To find and select all cells that have notes attached to them, select the Notes option.

To find and select all cells that contain number constants, text, logical values, error values, or any combination of these, select the Constants option, and turn off the check boxes for the types of constants you don't want selected.

To find and select cells containing formulas, select the Formulas option and turn off the check boxes for the types of formula results you don't want selected.

To find and select all blank cells, select the Blanks option.

4 Choose OK.

Microsoft Excel makes a multiple selection of all cells in the search area that contain the type of contents you selected in the dialog box. You can then move forward or backward through the cells in the selection with TAB and SHIFT+TAB, and move among areas of a multiple selection with CTRL+TAB and SHIFT+CTRL+TAB.

Finding the last cell on the worksheet

To locate the cell that marks the lower-right corner of the area being used on the worksheet, use the Formula Select Special command. The last cell marks the extent of the area of the worksheet that is saved when you save the worksheet; the unused rows below and columns to the right of the last cell are ignored. Finding the last cell is useful for checking the current size of the worksheet if you are concerned about how much memory or disk space the worksheet is using; the larger your worksheet, the more memory and disk space it requires.

To do this procedure, you must be using full menus.

1 Choose Formula Select Special.

2 Select the Last Cell option.

3 Choose OK.

Finding Cells That Refer to Each Other

Use the Formula Select Special command to find precedents (cells that are referred to by the formulas in the selected cells) or dependents (cells with formulas that refer to the selected cells). When searching for precedents and dependents, Microsoft Excel always searches the entire worksheet. If you select a cell range or multiple cells before searching for precedents or dependents, Microsoft Excel selects all cells in the worksheet that are precedents or dependents for any cell in the selection.

You can select just the direct precedents or dependents, or you can select the direct precedents or dependents plus their precedents or dependents, and so on, to select an entire network of related cells. This is a useful tool for tracing how cells are related in your worksheet, or for building macros that trace references.

For example, the following illustration shows the result of selecting just the direct precedents of cell F6:

Using the Formula Select Special command to select only the direct precedents of cell F6 selects F2:F4.

	A	B	C	D	E	F
1	Month	Classical	Rock	Jazz	Folk	Total Sales
2	Jan	$900	$1,025	$1,000	$500	$3,425
3	Feb	$700	$950	$850	$450	$2,950
4	Mar	$950	$1,100	$1,000	$400	$3,450
5						
6	TOTALS	$2,550	$3,075	$2,850	$1,350	$9,825
7						
8						

Cell F6 contains the formula =SUM(F2:F4).

And the following illustration shows the result of selecting all levels of precedents, direct and indirect, of cell F6:

Using the Formula Select Special command to select all levels of precedents of cell F6 selects B2:F4.

Cells F2:F4, the direct precedents of cell F6, contain these formulas: =SUM(B2:E2), =SUM(B3:E3), =SUM(B4:E4).

	A	B	C	D	E	F
1	Month	Classical	Rock	Jazz	Folk	Total Sales
2	Jan	$900	$1,025	$1,000	$500	$3,425
3	Feb	$700	$950	$850	$450	$2,950
4	Mar	$950	$1,100	$1,000	$400	$3,450
5						
6	TOTALS	$2,550	$3,075	$2,850	$1,350	$9,825
7						
8						

Cell F6 contains the formula =SUM(F2:F4).

Finding precedents and dependents

To do this procedure, you must be using full menus.

1 Select the cell or cells whose precedents or dependents you want to find.

If you select more than one cell, Microsoft Excel selects all the cells in the worksheet that are precedents or dependents for any of the selected cells.

2 Choose Formula Select Special.

3 To find the cells referred to by the formulas in the selected cells, select the Precedents option.

To find the cells with formulas that refer to the selected cells, select the Dependents option.

4 To find only the cells with precedents that are specifically referred to by the selected cells, or the dependents that specifically refer to the selection, select the Direct Only option.

To find all precedents, including the precedents of the precedents, or all dependents, including dependents of the dependents, select the All Levels option.

5 Choose OK.

Finding Cells That Differ from a Comparison Cell

You can find and select cells whose contents differ from the contents of another cell, called a *comparison cell*, in the same row or column. To select cells that differ, you use the Row Differences and Column Differences options in the Formula Select Special dialog box. If you select the Row Differences option, Microsoft Excel searches each selected row for cells that are different from the comparison cell in the same row. If you select the Column Differences option, Microsoft Excel searches each selected column for cells that are different from the comparison cell in the same column.

For example, suppose your worksheet contains a list of dates in column A formatted in a date format and a list of the same dates in column B formatted as integers, as shown in the following illustration. The dates in column B show the date serial number so it is difficult to tell whether or not the dates in column B correspond to the adjacent dates shown in column A. To find out if the dates entered in column B are correct, you would use the Formula Select Special command and select the Row Differences option. First, you would select the comparison cells and the cells you want to search:

	A	B
1	Formatted Date	Date Serial No
2	1/1/91	31777
3	2/1/91	31809
4	3/1/91	31836
5	4/1/91	31867
6	5/1/91	31897
7	6/1/91	31928
8	7/1/91	31959
9	8/1/91	31989
10	9/1/91	32010
11	10/1/91	32050
12		
13		

Cells B2:B11 will be searched for differences.

Cells A2:A11 are the comparison cells.

Then you would choose Formula Select Special and select the Row Differences option. Microsoft Excel would compare the contents of cell B2 to the contents of cell A2, the contents of cell B3 to the contents of cell A3, and so on, and select the cells in column B that do not match the corresponding cell in column A, as shown in the following illustration:

	A	B
1	Formatted Date	Date Serial No.
2	1/1/91	31777
3	2/1/91	31809
4	3/1/91	31836
5	4/1/91	31867
6	5/1/91	31897
7	6/1/91	31928
8	7/1/91	31959
9	8/1/91	31989
10	9/1/91	32010
11	10/1/91	32050
12		
13		

After choosing the Formula Select Special command and selecting the Row Differences option, Microsoft Excel selects the cells in column B whose contents do not match the contents of the corresponding cell in column A. Cells B3, B8, and B10 contain dates that do not match the corresponding date in column A.

Microsoft Excel determines which cells to use as the comparison cells and which cells to search for differences by checking what you have selected:

- The position of the active cell determines which column or row contains the comparison cells. If you are searching for row differences, the comparison cells are the cells in the same column as the active cell. In the previous example, the active cell was in column A, so the comparison cell for each row was the cell in column A. If you are searching for column differences, the comparison cells are the cells in the same row as the active cell. For example, if you selected Column Differences in the previous example, the comparison cells would be the cells in row 2.
- The current selection minus the comparison cells is the area Microsoft Excel searches for differences. The search range can be a multiple selection. After searching all of the selected cells, Microsoft Excel makes a multiple selection of all cells that are different from their corresponding comparison cells.

NOTE You can use cells outside of the current selection as the comparison cells by making a multiple selection. First, select the area or areas you want searched; then hold down COMMAND and click any cell in the column or row containing the comparison cells.

Microsoft Excel compares formulas based on the R1C1 reference style, which means that cells with identical relative references will not be selected as being different even though the references appear different in the A1 reference style.

For example, if cell A4 contains the formula =SUM(A1:A3) and cell B4 contains the formula =SUM(B1:B3), Microsoft Excel considers the references in these formulas identical, since both formulas refer to the three cells directly above them. The similarity of formulas is obvious in the R1C1 reference style since both cells would contain the formula =SUM(R[-3]C:R[-1]C).

Finding cells in the same row or column that are different

To do this procedure, you must be using full menus.

1. Select the range or ranges you want Microsoft Excel to search for row or column differences.
2. Place the active cell in the row or column you want Microsoft Excel to use as the basis for the comparison.
3. Choose Formula Select Special.
4. Select Row Differences or Column Differences.
5. Choose OK.

More About Finding and Replacing Cells and Data

MORE ABOUT

Guidelines

Using Wildcard Characters in Search Text You can use the question mark (?) and asterisk (*) as wildcard characters in the Find What box in the Formula Find dialog box and in the Replace box in the Formula Replace dialog box to find variations on a sequence of characters.

A question mark stands for any single character in the same position as the question mark. For example, if you type **sm?th** in the Find What box, Microsoft Excel would find a cell that contained either Smith or Smyth.

An asterisk stands for any number of characters in that same position. For example, if you type **sum(*)+2** in the Find What box, Microsoft Excel would find a cell that contained the SUM function with any argument typed within the parentheses plus 2. To find an actual question mark or asterisk, precede the question mark or asterisk with a tilde (~). For example, to find SUM(A1:B5)*2, type **sum(a1:b5)~*2**

MORE ABOUT

Finding Values by Comparing Them to a Constant Value If you want to find values on your worksheet that are greater than, less than, equal to, or not equal to a certain constant, you must define the search area as a database and use database criteria to find the data you want. If you try typing comparison operators (<, >, <=, >=, <>, or =) in the Find What box in the Formula Find dialog box or in the Replace With box in the Formula Replace dialog box, Microsoft Excel treats the operators as text and finds cells that contain the operator characters, not cells that compare to the value. To define the search area as a database, the area must be a legitimate database that includes text field names in the first row of the range. For information on defining and using a database, see Chapter 9, "Creating and Using a Database on a Worksheet."

Keyboard Shortcuts The keyboard shortcuts for accessing the commands covered in this section are listed in the following table.

NOTE If the keyboard shortcut includes a shifted key, such as a brace ({), you must hold down SHIFT when you press the keyboard shortcut key.

To choose this command and option	Press
Formula Find	COMMAND+J or SHIFT+F5
Formula Find (find next cell)	COMMAND+H or F7
Formula Find (find previous cell)	COMMAND+SHIFT+H or SHIFT+F7
Formula Select Special (Notes option)	COMMAND+O (letter o)
Formula Select Special (Row Differences option)	COMMAND+\
Formula Select Special (Column Differences option)	COMMAND+SHIFT+\
Formula Select Special (Precedents: Direct Only option)	COMMAND+[
Formula Select Special (Precedents: All Levels option)	COMMAND+SHIFT+[
Formula Select Special (Dependents: Direct Only option)	COMMAND+]
Formula Select Special (Dependents: All Levels option)	COMMAND+SHIFT+]
Formula Select Special (Last Cell option)	COMMAND+END

Tips

Finding External References To find all cells that contain references to other worksheets in their formulas, such as Budget!B2, choose the Formula Find command, type an exclamation point (!) in the Find What box, and select the Formulas option.

MORE ABOUT

Displaying Precedents and Dependents You can find cells that are precedents or dependents of selected cells using the Formula Select Special command. However, if you want to list all precedents and dependents for a cell so you can check your worksheet logic, use the Info window. With the Info window you can move around on the worksheet and display precedent and dependent information about each cell side by side with the worksheet window. For information on using the Info window, see "Auditing a Worksheet" in Chapter 6.

Scrolling to the Active Cell You can quickly scroll through the worksheet window to display the active cell by choosing the Formula Show Active Cell command or by pressing COMMAND+DELETE. You may find this useful if you scroll away from the active cell to view the other parts of a multiple selection created by using the Formula Select Special command and then want to return to the active cell without changing the selection.

Sorting Data

You can reorganize data on a worksheet alphabetically and numerically with the Data Sort command. You can sort the rows or columns in any selection and you can choose whether to sort the rows or columns in ascending or descending order.

You can specify up to three *sort keys* when sorting data. A sort key identifies which column to sort by when sorting rows, or which row to sort by when sorting columns. You can refer to any cell in a row or column to identify that row or column as a sort key.

If you use more than one sort key, columns or rows with the same entry for the first key are sorted according to the second and third keys. If you have not identified second and third keys, rows or columns with duplicates in the first key are left in the order in which they are found.

The sort order that Microsoft Excel uses if you specify ascending order is:

- Numbers
- Text
- Logical values
- Error values
- Blanks

If you specify descending order, Microsoft Excel reverses the order of everything except blank cells, which are always sorted last. For information on the sort order within each of the above categories, see "More About Sorting Data," later in this section.

NOTE The procedures for sorting data on a worksheet are the same as those for sorting data in a database.

Online Help also provides information on sorting data. To display online Help, choose the Window Help command. If you are using system software version 7.0 and the Help command does not appear on the Window menu, display Help by pointing to the Help menu icon and choosing the Microsoft Excel Help command. For information on a specific command, select the Commands topic. For information on using online Help, see "Using Help" in Chapter 1.

Sorting

1 Select the range you want to sort.

Everything within that range is reordered, based on the key rows or columns you specify. Nothing outside of that range is affected by the sort.

2 Choose Data Sort.

3 To sort rows (keep rows intact), select the Rows option.

To sort columns (keep columns intact), select the Columns option.

4 Enter the reference of your first key in the 1st Key box.

If you are sorting by rows, this can be the reference of any cell in the column you want to use as your first key column. If you are sorting by columns, this can be the reference of any cell in the row you want to use as your first key row.

You can accept the proposed reference, type a new one, or select one on the worksheet. If you need to select a cell that is hidden by the Data Sort dialog box, you can move the dialog box by dragging the title bar with the mouse.

5 To sort by more than one key, enter references in the 2nd Key and 3rd Key boxes.

6 Select Ascending or Descending order for each key you specify.

7 Choose OK.

Undoing a sort

If you don't like the way your data was sorted, you can undo the sort immediately after you sort.

▶ Choose Edit Undo Sort.

Sorting with More Than Three Keys

You can sort with more than three keys by sorting two or more times. When you sort with more than three keys, keep these guidelines in mind:

- The most recent sort takes precedence, so you should always do the last sort with the keys that are most important.
- Microsoft Excel retains the previous sort sequence in places where the current sort produces equal items.

For example, if you want to use five key columns to sort the rows of a selection, do one sort using the fourth and fifth most important columns designated as the first and second keys. Then do a second sort using the three most important columns as the keys.

Sorting with more than three keys

1 Sort using the three least important keys. Of those three keys, use the most important as the first key, the next as the second key, and the least important as the third key.

2 Sort using the next three keys, again using the most important of the three as the first key.

3 Continue sorting in this manner until you have sorted using the most important keys.

MORE ABOUT

More About Sorting Data

Guidelines

Sort Order For each key, select Ascending or Descending to specify the order in which you want the data sorted by that key. In ascending order, Microsoft Excel sorts in the following order, top to bottom for rows and left to right for columns:

- **Numbers** From the largest negative number to the largest positive number.
- **Text** According to the order shown in the following table. Microsoft Excel ignores capitalization when sorting text. The numbers shown in the text sort order refer to numbers that are entered as text values. Numbers that are entered as numeric values are sorted before text values.

Space	!	"	#	$	%	&	'	(	)	*	+	,	-	.	/	0	
1	2	3	4	5	6	7	8	9	:	;	<	=	>	?	@	A	B
C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T
U	V	W	X	Y	Z	[	\	]	^	_	`	{	|	}	~		

- **Logical values** FALSE before TRUE.
- **Error values** All error values are equal.
- **Blanks** Always sorted last.

In descending order, Microsoft Excel reverses the order of everything except blank cells, which are always sorted last.

NOTE If you're using Microsoft Excel with an international version of the Macintosh system, Microsoft Excel sorts the data according to the sorting rules of the country in use.

MORE ABOUT

Using Names Instead of Cell References as Sort Keys You can type a name in the 1st Key, 2nd Key, and 3rd Key boxes in the Data Sort dialog box instead of a cell reference. The name must already be defined on the active worksheet before you use it as a sort key. If the name refers to a range of cells, Microsoft Excel uses the upper-left cell in the named range as the sort key. For example, if the name Inventory refers to B5:F70, cell B5 would be used as the sort key.

Troubleshooting

Sorting Numbers If the range you are sorting contains numbers, make sure that you have entered the numbers as either all numeric values or as all text values. Otherwise, Microsoft Excel sorts the numbers entered as numeric values before sorting the numbers entered as text values. You can quickly check to see if Microsoft Excel is treating a cell as a number or text by looking at how the number is displayed in the cell. Unless you have used the Format Number command to change the cell display, cells use the default General format (numbers are right-aligned and text is left-aligned).

To enter a number as text, such as a postal code or part number, enter the text as a formula and type the numbers within double quotation marks. For example, if you type ="**98052**", Microsoft Excel interprets the postal code as text, not as a number.

Formatting a Worksheet

Microsoft Excel provides a variety of ways to control the appearance of your worksheet. This chapter shows you how to change the format of characters, assign and create number formats, align worksheet data, increase or decrease column widths and row heights, add borders and shading, format with cell styles, and change the display of your worksheet on your screen.

NOTE Unless otherwise noted, all information and procedures for working with worksheets also apply to macro sheets.

Table of Contents

Formatting Worksheet Data ... 175
Aligning Worksheet Data ... 186
Changing Column Widths and Row Heights ... 191
Formatting with Borders and Shading ... 196
Formatting with Cell Styles ... 198
Changing How Your Worksheet Is Displayed ... 206
Printing Your Worksheet ... 213

Formatting Worksheet Data

With Microsoft Excel, you can change the appearance of data in your worksheet by changing the font, size, style, and color of data in a cell, in text boxes, and in buttons.

You can format numbers to designate dollar amounts, percentages, decimals, or scientific notation. You can also format dates and times. Microsoft Excel has several built-in formats you can use, or you can create your own formats for whatever your specific needs are.

You can also format blank areas of the worksheet. When you later enter data into these formatted cells, Microsoft Excel automatically formats the data.

For information on	See
Entering Information	"Entering Worksheet Data" in Chapter 3

Online Help also provides information on formatting worksheet data. To display online Help, choose the Window Help command. If you are using system software version 7.0 and the Help command does not appear on the Window menu, display Help by pointing to the Help menu icon and choosing the Microsoft Excel Help command. For information on a specific command, select the Commands topic. For information on using online Help, see "Using Help" in Chapter 1.

NOTE The standard font, size, style, and color of worksheet data you enter into cells is determined by the Normal style. You can change the Normal style with the Format Style command. For more information about defining cell styles, and changing the Normal cell style, see "Formatting with Cell Styles," later in this chapter.

Changing the font, size, style, and color of cell entries

With the Format Font command, you can change the font, size, style, and color of any information you enter in a cell. When you assign these formats to a cell, they apply to the entire contents of the cell; you cannot format individual characters within the cell.

1. Select the cell, range, or entire worksheet you want to format.
2. Choose Format Font.
3. If you want to set the font to the same font specified in the Normal style, turn on the Normal Font check box and choose OK to complete this procedure.
4. In the Font box, select the font you want. Under Sample, Microsoft Excel shows you what the new formatting will look like.

   If the font you want is not listed, type the font name in the box below the Font box.
5. In the Size box, select the font size you want.

   If the font size you want is not listed, type the size in the box below the Size box.
6. Under Style, turn on or turn off the check boxes to set the styles as you want them.
7. In the Color box, select a color.

   To set the color to the system font color, select the Automatic option.
8. Choose OK.

Quickly formatting cells as bold and italic

You can quickly format cell entries as bold or italic by using the bold button (B) or italic button (I) in the tool bar.

1. Select the cell, range, or entire worksheet you want to format.
2. To format the cells in bold, click the bold button.

   To format the cells in italic, click the italic button.

   To format the cells in bold and italic, click both the bold button and the italic button, in any sequence.

Formatting text in text boxes or buttons

You can also change the font, size, style, and color of text in a text box or button. Formatting text in buttons or text boxes is basically the same as formatting a cell entry, except you can format characters separately in a text box and button rather than using only one format for the entire entry. You can change the format as you are typing, or you can select characters and format them after entering the text.

1. Click the text box or button.

   If a macro is assigned to the text box or button, hold down COMMAND and click the text box or button.

   You can format several text boxes and buttons at the same time by using the selection tool in the tool bar to select all the boxes or buttons you want to format.
2. To format all of the text, go to step 3.

   To format only some of the characters, select the characters you want to format.

   To type characters in a different format, position the insertion point where you want to change formatting and click. Any characters you type following the insertion point will use the format you choose.
3. Choose Format Font.

   If you want to change whether the text is bold or italic, you can click the bold or italic buttons in the tool bar instead of choosing the Format Font command.

4 In the Font box, select the font you want. Under Sample, Microsoft Excel shows you what the new formatting will look like.

   If the font you want is not listed, type the font name in the box below the Font box.

5 In the Size box, select the font size you want.

   If the font size you want is not listed, type the size in the box below the Size box.

6 Under Style, turn on or turn off the check boxes to set the styles as you want them.

7 In the Color box, select a color.

   To set the color to the system font color, select the Automatic option.

8 To open the Format Text dialog box so you can format the alignment and orientation of the text, choose the Text button; then select the options you want.

   To open the Format Patterns dialog box so you can format the border and fill, choose the Patterns button; then select the options you want. This button is available only if you selected a text box in step 1.

9 To apply all your changes and close the dialog box, choose OK.

Formatting with Number Formats

When you create a new worksheet, all cells use the General number format; General is the default format. When you type numbers in cells formatted as General, Microsoft Excel assigns the number a built-in format based on what you typed. For more information on entering numbers, the General format, and how Microsoft Excel interprets what you type, see "Entering Worksheet Data" in Chapter 3.

When you want to specify a different format for numbers, dates, or times, use the Format Number command. You can use one of the built-in formats, or you can create your own custom formats. When you choose Format Number, Microsoft Excel displays a dialog box with a list of the available number, date, and time formats. This list includes the built-in formats and any custom formats you have created. Except for General format, the choices in the list are combinations of symbols that represent what each format looks like. For more information on the built-in number, date, and time formats, see "Entering Worksheet Data" in Chapter 3. For a description of each of the symbols used in the Microsoft Excel number formats, see "More About Formatting Worksheet Data," later in this section.

The following table shows built-in number formats with examples of what is displayed when the cell contains a positive number, a negative number, and a fraction. The sections of a number format are separated by semicolons.

	Number Typed		
Format	5	-5	.5
General	5	-5	0.5
0	5	-5	1
0.00	5.00	-5.00	0.50
#,##0	5	-5	1
#,##0.00	5.00	-5.00	0.50
$#,##0_);($#,##0)	$5	($5)	$1
$#,##0_);[RED]($#,##0)	$5	($5)*	$1
$#,##0.00_);($#,##0.00)	$5.00	($5.00)	$0.50
$#,##0.00_);[RED]($#,##0.00)	$5.00	($5.00)*	$0.50
0%	500%	-500%	50%
0.00%	500.00%	-500.00%	50.00%
0.00E+00	5.00E+00	-5.00E+00	5.00E-01
# ?/?	5	-5	1/2
# ??/??	5	-5	1/2

*Displayed in red

NOTE The dollar formats produce a trailing space for positive numbers, so that all amounts align on the decimal point regardless of positive or negative values.

The following table lists the built-in date and time formats and shows examples of each format.

Format	Display
m/d/yy	3/4/91
d-mmm-yy	4-Mar-91
d-mmm	4-Mar
mmm-yy	Mar-91
h:mm AM/PM	8:50 PM
h:mm:ss AM/PM	8:50:35 PM
h:mm	20:50
h:mm:ss	20:50:35
m/d/yy h:mm	3/4/91 20:50

You also use the Format Number command to assign any custom formats you have created. When you choose Format Number, custom formats are listed following the built-in number, date, and time formats.

Assigning a number, date, or time format

1 Select the cells you want to format.

2 Choose Format Number.

3 In the Format Number box, select a number format.

If there is a number, date, or time in the active cell when you select a format, Microsoft Excel shows you under Sample how the number, date, or time will look with the selected format.

To select a custom format, scroll to the end of the list of built-in formats.

4 Choose OK.

Creating Custom Number, Date, and Time Formats

You can create your own number, date, and time formats in addition to the built-in formats. For example, if you want to enter social security numbers or telephone numbers, you can reduce data entry time by creating a custom number format that includes the hyphens. You can then enter just the numbers in the cells, and Microsoft Excel displays the numbers with the hyphens. For a list of the symbols used in Microsoft Excel number formats, and guidelines for using the symbols to create custom number formats, see "More About Formatting Worksheet Data," later in this section.

You can create a custom number, date, or time format in two ways:

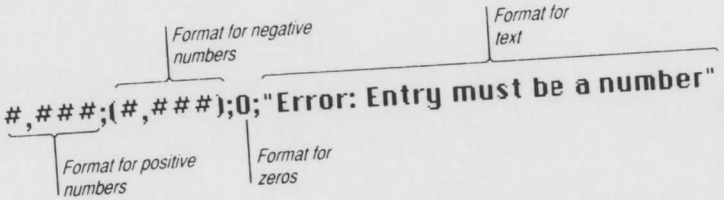
- **Edit a built-in format in the Format Number dialog box** You can quickly create a custom format similar to one that already exists by editing a built-in format in the Format box. When you choose OK, Microsoft Excel creates the new format while retaining the built-in format you edited.
- **Type your own format in the Format Number dialog box** Using the number, date, or time format symbols, type the format you want in the Format box.

The following table shows some examples of number formats you can create:

With this format	This number	Is displayed this way
#.##	1234.568	1234.57
	0.1	.1
#.0#	1234.568	1234.57
	12	12.0
#,##0"CR";#,##0"DR";0	1234.568	1,235CR
	–12.34	12DR
	0	0

With this format	This number	Is displayed this way
#.	12000	12
"X="0.0	1234.568	X=1234.6
	–12.34	–X=12.3
"X="0.0;"X="–0.0	–12.34	X =–12.3
$* #,##0.00;$* –#,##0.00	1234.568	$ 1,234.57
	–12.34	$ –12.34
000–00–0000	435690891	435-69-0891
"Acct. No."0000	8967	Acct. No. 8967
0;–0;	0	NOT DISPLAYED
;;;	Any number	NOT DISPLAYED
"Complete"	Any number	Complete

Each format you create can have up to three number sections and a fourth section for text. The sections are separated by semicolons. The number of sections you include determines the format for positive numbers, negative numbers, zeros, and text, in that order. If you include only two number sections, the first one is used for both positive numbers and zeros, and the second one for negative numbers. If you have only one number section, all numbers use that format. For each part of the format, you type symbols that represent how you want the number to look. A text format section, if included, is always the last section in the number format.



NOTE If you want, you can set your own conditions for the sections of the number format. For example you could specify that the first section be for numbers greater than 5,000, the second section for numbers less than 5,000, and the third for numbers equal to 5,000. For more information, see "More About Formatting Worksheet Data," later in this section.

In the text section, you can refer to any text in the cell by using the @ character as a text placeholder. Then, if there is text entered in the cell, it is displayed in the cell along with the text from the format's text section, and it replaces the @ character in that text.

If you have a text section, it changes how Microsoft Excel applies the number sections. For example, a number format with three sections, the last of which is not a text format, applies the format of the first section if the number is positive,

the second section if the number is negative, or the third section if the number is a zero. If a format has three sections and the last section is a text format, Microsoft Excel applies the format of the first section if the number is positive or a zero, the second section if the number is negative, or the third section if the cell contains text.

To set the color for a section of the format, just type the name of the color in square brackets in the section. For example, to create a number format that will display negative numbers in red, type **$* #,##0.00;[RED]$* -#,##0.00**

You can prevent any of the number types (positive, negative, zero) from being displayed by not entering placeholders for the corresponding section. For example, the number format #.##;– #.##;;@ will prevent zeros from being displayed because the third section is blank.

You can also create your own date and time formats for specialized uses in Microsoft Excel documents. Using a custom format can also simplify data entry. For example, you can format a range with a complex custom date or time format, and then type the data using a simpler format. Microsoft Excel displays the data in your custom format.

Here are some examples of date and time formats you can create:

If a cell has this format	And you enter	Microsoft Excel displays
m-d-yy	2/10/91	2-10-91
mm dd yy	2/10/91	02 10 91
mmm d, yy	2/10/91	Feb 10, 91
mmmm d, yyyy	2/10/91	February 10, 1991
d mmmm yyyy	2/10/91	10 February 1991
hh"h" mm"m"	4:48 PM	16h 48m
h.mm AM/PM	16:48	4.48 PM
hhmm "hours"	2:00	0200 hours

Creating a custom number, date, or time format

1 Select the cells you want to format.

2 Choose Format Number.

3 To edit a built-in format, select the format from the Format Number box.

4 In the Format box, edit the built-in format or type a new format.

Refer to the guidelines and table of the format symbols and their meanings in "More About Formatting Worksheet Data," later in this section.

5 Choose OK.

Microsoft Excel applies the new format to the selection and adds the new format to the end of the list so you can use it again. If you chose to edit a built-in format, the original built-in format remains and the new format you created from it is added to the end of the list.

Deleting a custom number, date, or time format

Microsoft Excel adds custom formats you create to the bottom of the list in the Format Number dialog box, so you can use the custom formats for other cells whenever you want. If you edited an existing format, Microsoft Excel adds the new format to the bottom of the list without changing the format you edited. You remove a custom format by deleting it with the Delete button. You cannot delete a built-in number format.

1 Choose Format Number.

2 In the Format Number box, scroll past the built-in formats and select the custom format you want to delete.

3 Choose the Delete button.

The dialog box remains open so you can delete other custom number formats if you want.

4 Choose OK.

MORE ABOUT

More About Formatting Worksheet Data

Guidelines

Symbols Used in Number Formats Each format symbol has its own meaning: Microsoft Excel uses these symbols in its built-in formats. You can also use these symbols to create your own formats.

Format symbol	Meaning
General	Display the number in General format.
0	Digit placeholder. If the number has fewer digits on either side of the decimal point than there are zeros on either side of the decimal point in the format, Microsoft Excel displays the extra zeros. If the number has more digits to the right of the decimal point than there are zeros to the right in the format, Microsoft Excel rounds the number to as many decimal places as there are zeros to the right. If the number has more digits to the left of the decimal point than there are zeros to the left in the format, Microsoft Excel displays the extra digits.
#	Digit placeholder. Follows the same rules as for 0 above, except that Microsoft Excel does not display the extra zeros if the number has fewer digits on either side of the decimal point than there are #'s on either side of the format.
?	Digit placeholder. Follows the same rules as for 0 above, except that Microsoft Excel places a space for insignificant zeros on either side of the decimal point so that decimal points align. You can also use this symbol for fractions that have varying numbers of digits.

MORE ABOUT

Format symbol	Meaning
. (period)	Decimal point. This symbol determines how many digits (0's or #'s) Microsoft Excel displays to the right and left of the decimal point. If the format contains only #'s to the left of this symbol, Microsoft Excel begins numbers less than 1 with a decimal point. To avoid this, you should use 0 as the first digit placeholder to the left of the decimal point instead of #.
%	Percentage. Microsoft Excel multiplies by 100 and adds the % character.
, (comma)	Thousands separator. Microsoft Excel separates thousands by commas if the format contains a comma surrounded by #'s or 0's. A comma following a placeholder scales the number by a thousand. For example, the format #, would scale the number by a thousand and the format #,, would scale the number by a million. The format 0.0,, would display the number 12,200,000 as 12.2.
E– E+ e– e+	Scientific format. If a format contains a 0 or # to the right of an E–, E+, e–, or e+, Microsoft Excel displays the number in scientific format and inserts an E or e. The number of 0's or #'s to the right determines the exponent's number of digits. E– or e– places a minus sign by negative exponents. E+ or e+ places a minus sign by negative exponents and a plus sign by positive exponents.
$ – + / () : space	Display that character. To display a character other than one of these, precede the character with a backslash (\) or enclose the character in double quotation marks (" "). You can also use the slash (/) character for fraction formats.
\	Display the next character in the format. Microsoft Excel does not display the backslash. This is the same as enclosing the next character in double quotation marks. If you enter any of the following symbols, Microsoft Excel provides the backslash for you: ! ^ & ' (left single quotation mark) ' (right single quotation mark) ~ {} = <>
*	Repeat the next character in the format enough times to fill the column width. You cannot have more than one asterisk in one section of a format.
_ (underline)	Skip the width of the next character. For example, in a format section for positive numbers, you could type _) at the end of the format section to have Microsoft Excel skip the width of the parenthesis characters, so positive numbers align with negative numbers that contain parentheses.
"*text*"	Display whatever text is inside the double quotation marks.
@	Text placeholder. If there is text entered in the cell, the text from the cell is placed in the format where the @ character appears.
m mm mmm mmmm	Display the month as a number without leading zeros (1–12), as a number with leading zeros (01–12), as an abbreviation (Jan–Dec), or as a full name (January–December). If you use m or mm immediately after the h or hh symbol, Microsoft Excel displays the minute rather than the month.

MORE ABOUT

Format symbol	Meaning
d dd ddd dddd	Display the day as a number without leading zeros (1–31), as a number with leading zeros (01–31), as an abbreviation (Sun–Sat), or as a full name (Sunday–Saturday).
yy yyyy	Display the year as a two-digit number (00–99), or as a four-digit number (1900–2078).
h hh	Display the hour as a number without leading zeros (0–23), or as a number with leading zeros (00–23). If the format contains any of the 12-hour-clock designators (AM, am, A, a, PM, pm, P, or p), the hour is based on the 12-hour clock. Otherwise, the hour is based on the 24-hour clock.
m mm	Display the minute as a number without leading zeros (0–59), or as a number with leading zeros (00–59). The m or mm must appear immediately after the h or hh symbol, or Microsoft Excel displays the month rather than the minute.
s ss	Display the second as a number without leading zeros (0–59), or as a number with leading zeros (00–59).
AM/PM am/pm A/P a/p	Display the hour using a 12-hour clock. Microsoft Excel displays AM, am, A, or a for times from midnight until noon; and PM, pm, P, or p for times from noon until midnight.
[BLACK]	Displays the characters in the cell in black.
[BLUE]	Displays the characters in the cell in blue.
[CYAN]	Displays the characters in the cell in cyan.
[GREEN]	Displays the characters in the cell in green.
[MAGENTA]	Displays the characters in the cell in magenta.
[RED]	Displays the characters in the cell in red.
[WHITE]	Displays the characters in the cell in white.
[YELLOW]	Displays the characters in the cell in yellow.
[COLOR *n*]	Where *n* is a number from 1 to 16 and displays the corresponding color in the color palette. For more information on the color palette, see "Creating a Custom Color Palette" in Chapter 16.
[*condition value*]	Where *condition* may be <, >, =, >=, <=, <>, and *value* may be any number. You can create your own conditional statements in the number formats. When you define a format, Microsoft Excel assumes the first section is for positive numbers (>0), the second section is for negative numbers (<0), and the third section is for all other entries. the [*condition value*] symbol lets you designate a different condition for number formats so you can set your own criteria for each section. For example, in the format **[>1000] [BLUE]#,##0; [<–1000] [RED]#,##0; [GREEN] #,##0**, the first section is the number format for entries greater than a thousand, the second section is for entries less than –1000, and the third section is for all other entries not covered by the first and second sections. If you have a format with only two sections and a conditional value only in the first section, the second section formats all entries not formatted by the first section.

Formatting Data in More Than One Worksheet at the Same Time When you're working with similar worksheets, you can save time by selecting these worksheets as a workgroup. The changes you make in the active worksheet are automatically duplicated in the same location in all the sheets in the workgroup. For information on defining a workgroup and a list of Microsoft Excel commands that can be used with a workgroup, see "Editing Worksheets as a Group" in Chapter 8.

Aligning Worksheet Data

You can format cell entries and text box and button text so the data is aligned to the left, center, or right. The standard alignment setting is the General alignment option, controlled by the Format Alignment command. With General alignment, text is automatically aligned to the left in a cell, numbers to the right, and logical and error values in the center. You can also repeat characters across an entire cell or range, wrap long entries in a single cell, split long entries into several cells, and align text box or button text.

For information on	See
Aligning headers and footers	"Setting Up Your Pages" in Chapter 15

Online Help also provides information on aligning worksheet data. To display online Help, choose the Window Help command. If you are using system software version 7.0 and the Help command does not appear on the Window menu, display Help by pointing to the Help menu icon and choosing the Microsoft Excel Help command. For information on a specific command, select the Commands topic. For information on using online Help, see "Using Help" in Chapter 1.

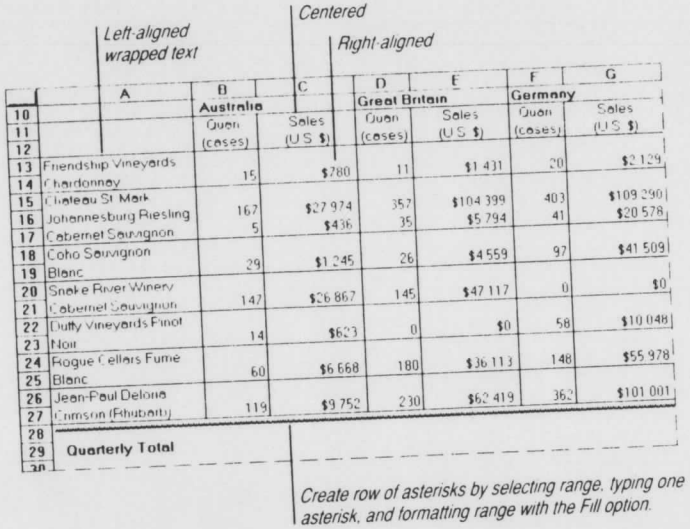
Aligning Worksheet Data Within Cells

When you choose the Format Alignment command, Microsoft Excel displays the following options:

- **General** Aligns text to the left and numbers to the right, and centers logical and error values.
- **Left** Aligns all selected cell entries to the left.
- **Center** Centers all selected cell entries.
- **Right** Aligns all selected cell entries to the right.
- **Fill** Repeats the contents of the selected cells until the cells are full. If there are blank cells to the right that also have the Fill format, they are filled as well.

- **Wrap Text** When this check box is turned on, long cell entries of text are displayed on multiple lines in a single cell. Text wrapped in a cell can be left-aligned, right-aligned, or centered. If you select the Fill option when the Wrap Text check box is turned on, Microsoft Excel fills the cell but does not wrap the filled characters. For wrapped text, Microsoft Excel automatically increases the row height to accommodate all of the text in your cell entry.

The following illustration shows examples of these alignments:


Left-aligned wrapped text
Centered
Right-aligned
Create row of asterisks by selecting range, typing one asterisk, and formatting range with the Fill option.

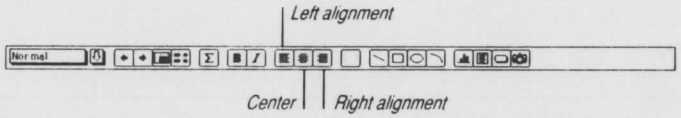
	A	B	C	D	E	F	G
10		Australia		Great Britain		Germany	
11		Quan (cases)	Sales (U.S. $)	Quan (cases)	Sales (U.S. $)	Quan (cases)	Sales (U.S. $)
12							
13	Friendship Vineyards Chardonnay	15	$780	11	$1,431	20	$2,129
14	Chateau St Mark Johannesburg Riesling	167	$27,974	357	$104,399	403	$109,290
15	Cabernet Sauvignon	5	$436	35	$5,794	41	$20,578
16	Coho Sauvignon Blanc	29	$1,245	26	$4,559	97	$41,509
17	Snake River Winery Cabernet Sauvignon	147	$26,867	145	$47,117	0	$0
18	Duffy Vineyards Pinot Noir	14	$623	0	$0	58	$10,048
19	Rogue Cellars Fumé Blanc	60	$6,668	180	$36,113	148	$55,978
20	Jean-Paul Delona Crimson (Fbubarb)	119	$9,752	230	$62,419	362	$101,001
21							
22	Quarterly Total						

Aligning text and numbers

1. Select the cells you want to format.
2. Choose Format Alignment.
3. Select the options for the alignment you want.
4. Choose OK.

Aligning text and numbers from the tool bar

You can quickly change the alignment of text in cells, text boxes, or buttons by using the alignment buttons in the tool bar. The following illustration shows the alignment buttons in the tool bar:



1. Select the cell, range, text boxes, buttons, or entire worksheet you want to format.

   To select a button or text box that has a macro assigned to it, hold down COMMAND and click the button or text box.

   You can format several text boxes and buttons at the same time by using the selection tool in the tool bar to select all the boxes or buttons you want to format.

2. In the tool bar, click the alignment button for the alignment you want.

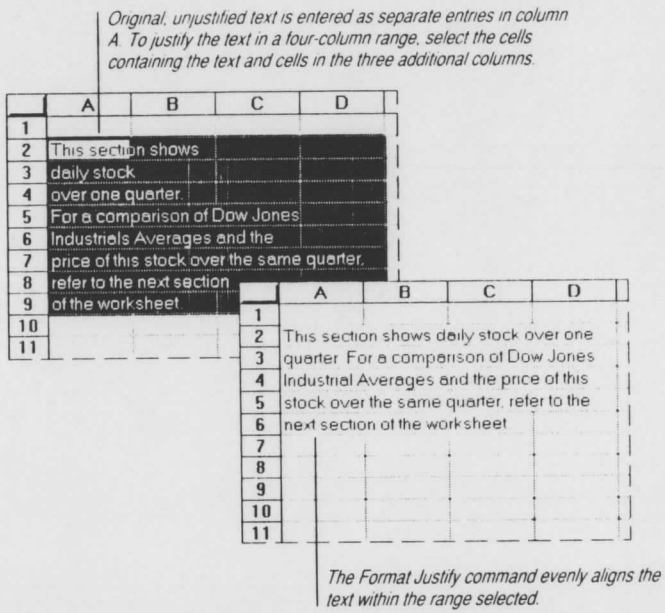
Justifying Text

You can use the Format Justify command to split a long cell entry into several cells, or to combine text from several cells so you can rearrange the text to evenly fill a range of cells.

NOTE You can use the Format Justify command only for ranges that contain text or blank cells. If you select a range that contains numeric values, Microsoft Excel displays a message indicating that nontext cells are in the range.

When you justify text, you rearrange the text so it fits into a specified area. You do this to make the text easier to read, or more attractive, for example, in a report. Normally text you type in a cell is carried over into adjacent cells if the text is longer than the cell width and the adjacent cells are blank. Even though it may cover more than one cell, the text "belongs" only to the cell in which it was typed. You can use the Format Justify command to rearrange the long text entry within a selected range. Also, if you've entered text in several consecutive rows, you can use the Format Justify command to rearrange the text into a selected range.

The following illustration shows how to justify a long paragraph, which is entered in one column, into four columns on a worksheet:


Original, unjustified text is entered as separate entries in column A. To justify the text in a four-column range, select the cells containing the text and cells in the three additional columns.
A
B
C
D
1
2 This section shows
3 daily stock
4 over one quarter.
5 For a comparison of Dow Jones
6 Industrials Averages and the
7 price of this stock over the same quarter,
8 refer to the next section
9 of the worksheet
10
11
This section shows daily stock over one quarter. For a comparison of Dow Jones Industrial Averages and the price of this stock over the same quarter, refer to the next section of the worksheet
The Format Justify command evenly aligns the text within the range selected.

Blank cells in the left column act as paragraph separators. A blank cell or cells divide the range into separate sections that are each justified individually. For example, if the selected cell range is five rows high, and the third cell in the left column is blank, then the top two rows of the selection are justified together and the bottom two rows of the selection are justified together.

NOTE Before you justify a paragraph, you may want to adjust column widths in the range affected. With the keyboard, select one cell in each column you want to adjust and use the Format Column Width command. Or, with the mouse, drag the vertical gridline to the right of the column heading in each column you want to adjust. For more information, see the next section, " Changing Column Widths and Row Heights."

IMPORTANT If the range you have selected is not large enough to accommodate the text, Microsoft Excel asks you if it can go beyond the current length of the selection. If you choose OK, and there is data in the cells that will be overlapped by the justification, the contents of those cells is replaced by the justified text; if you don't want the justified text to go beyond the current selection, cancel the command and change column widths or the size of the selection you want to justify.

Justifying text

To do this procedure, you must be using full menus.

1. Select the cells containing the text you want to justify, and include the entire range in which you want the justified text to appear.
2. Choose Format Justify.

Aligning Text Box and Button Text

You can change the horizontal and vertical alignment of text in a text box or button and you can also rotate the text to a vertical orientation. You can also choose whether the text box automatically changes size to fit the text or stays the same until you change it.

Formatting the alignment of text box and button text

1. Click the text box or button.

   If the text box or button has a macro assigned to it, hold down COMMAND and click the text box or button.

   You can format several text boxes and buttons at the same time by using the selection tool in the tool bar to select all the boxes or buttons you want to format.
2. Choose the Format Text command.
3. Under Horizontal, select the horizontal alignment you want.
4. Under Vertical, select the vertical alignment you want.
5. Under Orientation, select the text orientation you want.
6. If you want the text box or button size to adjust automatically to fit the text, turn on the Automatic Size check box.

   If you want the size to remain fixed until you change it, turn off the Automatic Size check box. Once you size the text box or button yourself, the Automatic Size check box is turned off.
7. Choose OK.

While the dialog box is displayed, you can also choose the Font button to open the Format Font dialog box so you can change the font, size, style, and color of the text in a text box or button. If a text box is selected, you can also choose the Patterns button to open the Format Patterns dialog box so you can format the border and fill. For more information, see "Formatting Worksheet Data," preceding in this chapter, and "Formatting a Graphic Object" in Chapter 14.

MORE ABOUT

More About Aligning Worksheet Data

Guidelines

Adjusting Row Heights When Wrapping Text When you select the Wrap Text option in the Format Alignment dialog box, the row height expands as needed. If a row height is set to a fixed value, Microsoft Excel displays as many lines of text as will fit within that row height.

Microsoft Excel does not automatically adjust row height to accommodate font size changes in cells that contain wrapped text. To adjust row height after changing font size in wrapped text, double-click the line below the row heading.

The Difference Between the Wrap Text Option and the Format Justify Command Use the Wrap Text option in the Format Alignment dialog box if you have a long text entry in a cell and you want to wrap the text within a cell and adjust the row height to accommodate the entry. Use the Format Justify command if you have several entries in consecutive rows and you want to combine them into a selected range, or if you have a long cell entry and you want to split it into a selected range.

Changing Column Widths and Row Heights

You can format your worksheet by increasing or decreasing the column width and row height of selected columns and rows. You can even hide and unhide rows and columns or have Microsoft Excel adjust the column width to fit the longest cell entry in a column.

For information on	See
Formatting the display of your worksheets on screen	"Changing How Your Worksheet Is Displayed" later in this chapter

Online Help also provides information on changing column widths and row heights. To display online Help, choose the Window Help command. If you are using system software version 7.0 and the Help command does not appear on the Window menu, display Help by pointing to the Help menu icon and choosing the Microsoft Excel Help command. For information on a specific command, select the Commands topic. For information on using online Help, see "Using Help" in Chapter 1.

Changing the Width of a Column

You can set the width of selected columns with the Format Column Width command, or by dragging the line to the right of the column heading with the mouse.

You can hide a column by choosing the Hide button in the Format Column Width dialog box. If a column is hidden, you can make it visible again by choosing the Unhide button.

By choosing the Best Fit button in the Format Column Width dialog box, you can have Microsoft Excel calculate the column width necessary to accommodate the longest cell entry in the selected column.

NOTE When you have Microsoft Excel set the optimal column width with the Best Fit button, Microsoft Excel calculates the column width based on screen fonts rather than printer fonts. To correctly fit a column for printing, you must adjust the column widths in Print Preview. For more information about print preview see, "Previewing Your Pages" in Chapter 15.

If you have chosen the Best Fit button for a column and then you increase a cell entry in that column to be longer than the new optimal column width, you must choose Format Column and choose the Best Fit button again to recalculate the optimal column width.

Adjusting column width

The Format Column Width command changes the width of all columns in the selection, including hidden columns.

1. If you want to change the width of more than one column, select entire columns by dragging through the column headings.

   You can add columns to the selection by holding down COMMAND and clicking the column heading.

2. Drag the line to the right of the column heading for the column you want to change. The column width increases if you drag the line towards the right and decreases if you drag the line towards the left.

   To quickly adjust the column width to the best fit for the longest cell entry in the column, double-click the line to the right of the column heading.

   If more than one column is selected, dragging or double-clicking the column heading line for one column changes the column width of all the selected columns.

1. Select the column or columns you want to change.

   You don't need to select the entire column. If any cell in a column is selected, the new column width applies to all cells in that column.

2. Choose Format Column Width.
3. Enter the new column width you want.

   To adjust the column to the optimal size for the longest cell entry in the selection, choose the Best Fit button.

   Column width can be up to 255 characters wide. You can accept the proposed response or type a different width. You can define column widths in decimal fractions. If the Standard Width check box is turned on, it changes the size of the selected columns to the standard column width. The standard column width is 10 characters, but the actual width you see on the screen varies depending on the width of the font defined for the Normal style.

4. Choose OK.

Hiding a column

1. If you want to hide more than one column, select the columns you want to hide by dragging through the column headings.

   You can add columns to the selection by holding down COMMAND and clicking the column heading.

2. Position the mouse pointer on the line to the right of the heading of the column you want to hide. If you are hiding more than one column, position the pointer on the line to the right of the heading of any selected column.
3. Drag into the next column heading to the left.

1. Select the column or columns you want to hide. You don't need to select the entire column. If any cell in a column is selected, that column will be hidden.
2. Choose Format Column Width.
3. Choose the Hide button.

Making a hidden column visible

1. Position the mouse pointer to the right of the hidden column's column heading.
2. Drag to the right.

1. Select the visible columns on both sides of the hidden column.
2. Choose Format Column Width.
3. Choose the Unhide button.

Changing the Height of a Row

You can set the height of selected rows with the Format Row Height command, or by dragging the line below the row heading with the mouse.

You can hide a row by choosing the Hide button in the Format Row Height dialog box. If a row is hidden, you can make it visible again by choosing the Unhide button.

If the Standard Height check box is turned on in the Format Row Height dialog box, Microsoft Excel changes the row height to accommodate the largest font in each row of the selection. The Standard Height check box does not adjust rows to accommodate font size changes in cells that contain wrapped text. You can quickly adjust the row height after changing font size by double-clicking the line below the row heading. For more information on wrapped text, see the previous section, "Aligning Worksheet Data."

Adjusting the row height

The Format Row Height command changes the height of all rows in the selection, including hidden rows.

1. If you want to change the height of more than one row, select entire rows by dragging through the row headings.

   You can add rows to the selection by holding down COMMAND and clicking the row headings.

2. Drag the line below the row heading for the row you want to change. The row height increases if you drag down and decreases if you drag up.

   To quickly adjust the row height to accommodate the largest font in the row, or to adjust row height for cells containing wrapped text, double-click the line below the row heading.

   If more than one row is selected, dragging or double-clicking the row heading line for one row changes the row height of all the selected rows.

1. Select the row or rows you want to change. You don't need to select the entire row. If any cell in a row is selected, the new row height applies to all cells in that row.
2. Choose Format Row Height.
3. Enter the new row height you want.

   To adjust the row to the best size for the largest font in the row, turn on the Standard Height check box.

   Row height is measured in points, as are fonts. You can accept the proposed response or type a different height. You can define row heights in decimal fractions.

4. Choose OK.

Hiding a row

1. If you want to hide more than one row, select the rows you want to hide by dragging through the row headings.

   You can add rows to the selection by holding down COMMAND and clicking the row headings.

2. Position the mouse pointer on the line below the heading of the row you want to hide.

   If you are hiding more than one row, position the pointer on the line below the heading of any selected row.

3. Drag into the row heading above.

1. Select the row or rows you want to hide.

   You don't need to select the entire row. If any cell in a row is selected, that row will be hidden.

2. Choose Format Row Height.
3. Choose the Hide button.

Making a hidden row visible

1. Position the mouse pointer below the hidden row's row heading.
2. Drag down.

1. Select the visible rows on both sides of the hidden row.
2. Choose Format Row Height.
3. Choose the Unhide button.

MORE ABOUT

More About Changing Column Widths and Row Heights

Guidelines

Standard Column Width The standard column width in a new worksheet is 10 characters wide. When displaying formulas, Microsoft Excel doubles the displayed width of the columns. The doubled column width is also the standard display in a macro sheet.

Maximum Column Width You can make a column as wide as the worksheet window (up to 255 characters) or as narrow as a fraction of one character. When you change a column width, the stored contents of the cells do not change; only the number of characters displayed changes.

Column Width and Font Size Microsoft Excel sets column width based on the width of characters in the font defined for the Normal style. The number of characters actually displayed in a cell may vary depending on the font (for example, Helv or TmsRmn), font size, and font style (for example, bold or italic).

For more information on using fonts, see "Formatting Worksheet Data," earlier in this chapter.

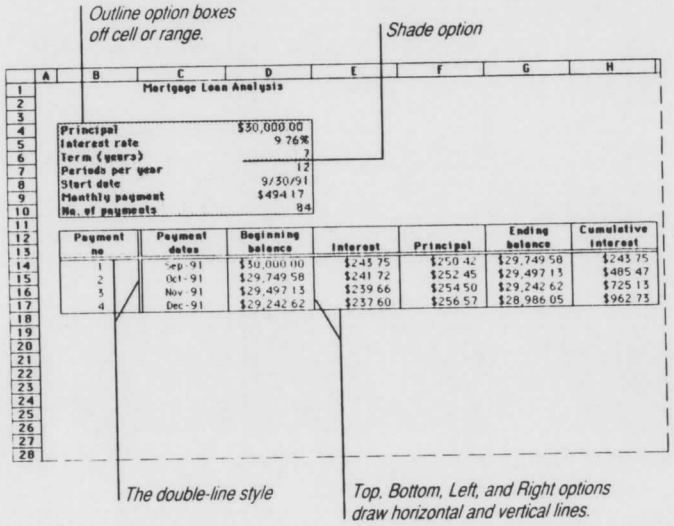
Troubleshooting

If Microsoft Excel Displays ###### in a Cell If you enter numbers that do not fit within the display boundary of a column width, Microsoft Excel stores the data but displays number signs (###) in the cell. To fully display the numbers, increase the column width.

Formatting with Borders and Shading

Borders and shading are useful for highlighting key information and making a worksheet easier to read. With Microsoft Excel you can easily box off or shade cells or cell ranges on a worksheet. In addition, you can draw any combination of horizontal and vertical lines on the left, right, top, or bottom of a cell. You can create double underlines and column lines for ledgers. You can also apply borders and shading to blank cells to improve the appearance of a report or data entry form.

The Format Border command controls border formats, and the Format Patterns command controls shading formats. The following illustration shows how you can use Format Border settings to enhance a worksheet:



The Format Border command adds border lines to the selected cells. When you choose the Format Border command, Microsoft Excel displays the following options:

- **Outline** Puts a border around the outermost edges of the entire selection.
- **Left** Puts a border on the left edge of every cell in the selection.
- **Right** Puts a border on the right edge of every cell in the selection.
- **Top** Puts a border on the top edge of every cell in the selection.
- **Bottom** Puts a border on the bottom edge of every cell in the selection.

- **Style** Sets the styles of the border line. These styles include: hairline, thin, medium, thick, double, dotted, dashed, and no lines.
- **Color** Sets the border line color.
- **Shade** Applies the standard shading to the selection.

When you choose the Left, Right, Top, Bottom, or Outline options, a sample of the line style and color appears next to the option.

Adjoining cells share borders. For example, putting a bottom border on one cell produces the same effect as putting a top border on the cell below it.

Borders are different from gridlines. By hiding the gridlines on a worksheet, you can make formats such as borders, double underlining, and shading stand out. To hide gridlines when you display a worksheet, choose Options Display and turn off the Gridlines check box. To hide gridlines when you print a worksheet, choose File Page Setup and turn off the Gridlines check box. For more information about gridlines on your display, see "Changing How Your Worksheet Is Displayed," later in this chapter. For more information about printing gridlines, see "Setting Up Your Pages" in Chapter 15.

For information on	See
Formatting the display of your worksheets on screen	"Changing How Your Worksheet Is Displayed" later in this chapter

Online Help also provides information on formatting with borders and shading. To display online Help, choose the Window Help command. If you are using system software version 7.0 and the Help command does not appear on the Window menu, display Help by pointing to the Help menu icon and choosing the Microsoft Excel Help command. For information on a specific command, select the Commands topic. For information on using online Help, see "Using Help" in Chapter 1.

Adding borders or shading

When adding borders, you first select the line style and color and then select where you want the borders to appear. Each border—left, right, top, or bottom—can have its own line style and color.

1. Select the cell or cells you want to format.
2. Choose Format Border.
3. Under Style, select the line style you want.
4. In the Color box, select the color you want.
5. Under Border, select where you want the borders to appear on the selected cells. To set additional borders using different line styles or colors, you can select any option under Border and repeat steps 3 and 4. To put a border around the outermost edges of the selected cells, select the Outline option.
6. If you want the selected cells to be shaded, turn on the Shade check box.
7. Choose OK.

Adding shading

The Format Patterns command gives you options for changing the shading of the selected cells. You can select your own background and foreground colors and cell pattern.

To do this procedure, you must be using full menus.

1 Select the cell or cells you want to format.

2 Choose Format Patterns.

3 In the Pattern, Foreground, and Background boxes, select the shading pattern and foreground and background colors you want. If you select the Automatic option, Microsoft Excel uses the standard window foreground and background colors and cell pattern.

Under Sample, Microsoft Excel shows what the new formatting will look like.

If you want no pattern, select the None option in the Pattern box.

4 Choose OK.

More About Formatting with Borders and Shading

Troubleshooting

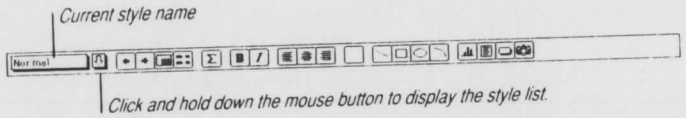
Border Style Conflicts If two cells share a border but each cell assigns a different style to that border, only one border style appears.

Formatting with Cell Styles

With Microsoft Excel, you can specify a combination of formats for a cell and apply this combination of formats all at once. This combination of formats is called a *style*. With styles, you only need to choose the formats you want for a cell once, give this combination of formats a name to identify it, and then apply the style name whenever you want that combination of formats in a cell. This lets you give cells the same formats without having to select the individual formatting commands repeatedly.

If you decide to change a style, you can redefine it by selecting a different combination of formats. When you change a style, all the cell entries that have the style automatically change to reflect the new formats in the style. Once you have a style defined, you can use the style in various worksheets by copying it to the different documents.

You can apply and define styles with the style list in the tool bar or with the Format Style command. The style list in the tool bar contains only the names of the styles in the current worksheet; the Format Style dialog box also supplies a description of each style. The following illustration shows the style list in the tool bar.



There are six attributes for which you can specify formats and which you can apply to a cell. These attributes are: Number, Font, Alignment, Border, Pattern, and Protection. Generally, all six are included in a style; however, you can include or exclude formats for any of the six attributes.

Microsoft Excel comes with several styles already created for you. Initially, all cells have the Normal style. You can create your own styles, apply built-in styles or the styles you create, and redefine the built-in styles or the styles you create.

For information on	See
Formatting with fonts	"Formatting Worksheet Data" earlier in this chapter
Formatting numbers, dates, and times	"Formatting Worksheet Data" earlier in this chapter
Aligning text and numbers	"Aligning Worksheet Data" earlier in this chapter
Borders, shading, and patterns	"Formatting with Borders and Shading" earlier in this chapter
Setting the protection status of worksheet cells	"Protecting Documents and Windows" in Chapter 16

Online Help also provides information on formatting with cell styles. To display online Help, choose the Window Help command. If you are using system software version 7.0 and the Help command does not appear on the Window menu, display Help by pointing to the Help menu icon and choosing the Microsoft Excel Help command. For information on a specific command, select the Commands topic. For information on using online Help, see "Using Help" in Chapter 1.

Applying a Style

With Microsoft Excel, there are two ways to apply a style: with the style list in the tool bar and with the Format Style command. The style list in the tool bar contains all of the styles available in the current worksheet; it's a quick and easy way to apply a style. When you apply a style with the Format Style command, the Format Style dialog box displays a description of the formats that make up the style.

When you apply a style to a cell, the formats contained in the style override any individual formats previously applied to the cell. For example, if a cell is formatted with right alignment and you apply a style that contains left alignment, the cell changes to left alignment. However, if you apply a style first and then add formats from the Format menu, the added formats take precedence over the style.

If an attribute is not defined for a style, that attribute is not overridden in any cell that the style is applied to. For example, you might want all summary data in a report bold and left-aligned, but with pattern, number, border, and protection formats varying for each field. By applying a style that includes only the font and alignment attributes, you can have the fields retain their individual pattern, number, border, and protection formats.

Applying a style from the tool bar

1. Select the cells you want to format.
2. Point to the arrow next to the current style name in the tool bar to display the style list, and then drag to select the style you want to apply.

   Or, you can click the current style name in the tool bar and then type the name of the style you want to apply.
3. If you typed the style name, press ENTER.

Microsoft Excel applies the style, and formats the selected cells.

Applying a style with the Format Style command

1. Select the cells you want to format.
2. Choose Format Style.
3. In the Style Name box, select or type the name of the style you want to apply.

   If you select the style name, Microsoft Excel displays a description of the style.
4. Choose OK.

   Microsoft Excel applies the style and formats the selected cells.

Creating a Style

You can create styles in the following ways:

- **By example** If you already used the Format menu commands to apply the combination of formats you want to a cell, you can create a style by selecting the cell and assigning that group of formats a style name.
- **By definition** You can specify the combination of formats you want with the Format Style command.
- **By copying styles from another document** If you are using a document that has styles, you can copy the styles to any document.

When you create a style, you assign a name to the combination of formats you want. This name is used to identify the style. Then, when you want a cell to have that combination of formats, you can apply the style name rather than make all the individual formatting changes.

Creating a style by example with the tool bar

1. Select a cell that has the desired combination of formats.
2. Click the current style name in the tool bar.
3. Type a name for the style.
4. Press ENTER.

Creating a style by example with the Format Style command

1. Select a cell that has the combination of formats you want.
2. Choose Format Style.
3. Type a name for the style.

   The name you enter defines the combination of formats in the selected cell as a style. You use the name of the style whenever you want to refer to this combination of formats.
4. Choose OK.

NOTE If you select multiple cells with conflicting formats and choose Format Style, the style is based on the formats the selected cells have in common. For example, if all the cells you selected have identical number formats, the proposed style would include the number attribute; otherwise, the number attribute would be turned off and its description would be omitted.

Creating a style by definition

1. Choose Format Style.
2. Choose the Define button.

   The Format Style dialog box expands.
3. In the Style Name box, type a name for the style.
4. Turn off the check boxes for the attributes you do not want to have in the style. Turn on the check boxes for the attributes you want the style to have.

   Initially, all attributes are included. If cells in the selection have conflicting formats for an attribute, the check box for that attribute is turned off. When the check box for an attribute is turned off, the corresponding button for that attribute becomes unavailable and the description for this attribute is omitted.
5. To change the formats for any of the attributes, choose the button that corresponds to the attribute you want to change.

6 Select the formats you want for the attribute.

7 To accept the formats you chose and return to the Format Style dialog box, choose OK.

8 Repeat steps 5 through 7 until you have selected all the formats you want for the style.

9 To define the style, apply the style to the selected cells, and close the dialog box, choose OK.

To define the style and keep the Format Style dialog box open so you can create other styles, choose the Add button. When you are finished creating styles, choose OK to apply the currently selected style to the selected cells, or choose the Close button to close the dialog box without applying any of the styles.

Copying styles from another document

When you copy styles from another document, you must have both the document you are copying to and the document you are copying from open in the workspace.

1 Open both the document that contains the styles you want to copy and the document you want to copy the styles to.

2 Activate the document that you want to copy the styles to.

3 Choose Format Style.

4 Choose the Define button.

5 Choose the Merge button.

Microsoft Excel displays a list of the documents that are open in the workspace.

6 Select the name of the document that contains the styles you want to copy.

7 Choose OK to copy the styles and style names from the document you selected to the active document.

8 Choose the Close button to close the Format Style dialog box.

IMPORTANT If the active document contains any styles that have the same name as styles you are copying, Microsoft Excel warns you and you can choose to change the existing styles in the active document, keep the existing styles, or cancel the procedure. You receive this warning only once, regardless of the number of conflicting style names.

Redefining a Style

Once you have defined a style and given it a name, you can change the style and automatically update any cells that have the style to reflect the new combination of formats. You can also redefine any of the built-in styles, such as the Normal style.

NOTE When you redefine a style, all the cells that have the style applied to them change to reflect the new definition of the style. However, if you applied any individual formatting to a cell that uses the redefined style, the formatting does not change to reflect the new style definition. The redefined style must be reapplied to the cell. For example, suppose you defined a style named CenterBold to contain the formats Font: Helv 10 Bold, Number: 0%, Alignment: Centered, and you applied this style to cell A1. Then you applied the number format $0.00 to cell A1. If you change the alignment format for the CenterBold style to left-aligned, the number format for cell A1 remains as $0.00 when the style is redefined. To change the number format to match the redefined style, reapply the style.

Redefining a style by example

1 Select a cell that has been assigned the style you want to change.

2 Format the cell with the new formatting that you want the style to have.

3 Reapply the style name to the cell using either the style list in the tool bar or the Format Style command.

Microsoft Excel asks if you want to redefine the style based on the current selection.

4 To redefine the existing style, choose the Yes button.

To reapply the old style and eliminate any new formatting you added to the cell, choose the No button.

To keep the old style and the new formatting you added to the cell, choose the Cancel button.

Redefining a style by definition

1 Choose Format Style.

2 Choose the Define button.

The Format Style dialog box expands.

3 In the Style Name box, select or type the name of the existing style you want to change.

If you select the style name, rather than type it, the formats of the style are displayed as the description and serve as your starting point for making changes to the style.

If you type the existing style name, the formats of the currently selected cell are displayed as the description and serve as your starting point for the style.

4 Turn off the check boxes for any attributes you want removed from the style. Turn on the check boxes for any attributes you want to add to the style.

When you turn off a check box, the corresponding button becomes unavailable, and the description for this attribute is removed.

5 Choose the button that corresponds to the attribute you want to change.

6 Select the new format or formats you want for that attribute.

7 To accept the formats and return to the Format Style dialog box, choose OK.

8 Repeat steps 5 through 7 until you have selected all the formats you want for the style.

9 To accept the changes, apply the new style to the selected cells, and close the dialog box, choose OK.

To accept the changes and keep the Format Style dialog box open so you can create or redefine other styles, choose the Add button. When you are finished creating or redefining styles, choose OK to apply the currently selected style to the selected cells, or choose the Close button to close the dialog box without applying any of the styles.

All cell entries having a style that has been redefined change to reflect the new formats in the style.

Redefining the Normal style

When you enter data into a cell, Microsoft Excel formats the data with a standard combination of formats called the Normal style. If you want to change the standard way data is formatted in a cell, redefine the Normal style with the Format Style command.

The Normal style initially consists of the following combination of formats: the number format is General, the font is Geneva 10, the alignment format is General, there are no borders, there is no shading, and the protection is locked.

Use the following procedure if you want to change any of these default formats.

1 Choose Format Style.

2 Choose the Define button.

The Format Style dialog box expands.

3 In the Style Name box, select or type the style name Normal.

If you select the style name, the formats of the style are displayed as the description and serve as your starting point for making changes to the style.

If you type the style name, the formats of the currently selected cell are displayed as the description and serve as your starting point for the style.

4 Turn off the check boxes for any attributes you want removed from the style. Turn on the check boxes for any attributes you want to add to the style.

When you turn off a check box, the corresponding button becomes unavailable, and the description for this attribute is removed.

5 Choose the button that corresponds to the attribute you want to change.

6 Select a new format or formats you want for that attribute.

7 To accept the formats and return to the Format Style dialog box, choose OK.

8 Repeat steps 5 through 7 until you have selected the combination of formats you want in the Normal style.

9 To accept the changes, apply the new standard style to the selected cells, and close the dialog box, choose OK.

To accept the changes and keep the Format Style dialog box open so you can create or redefine other styles, choose the Add button. When you are finished creating or redefining styles, choose OK to apply the currently selected style to the selected cells, or choose the Close button to close the dialog box without applying any of the styles.

All cell entries that have the Normal style assigned to them automatically change to reflect the redefined Normal style. Any new entry you make in a cell that has the Normal style assigned to it will be formatted with the new Normal style.

Deleting a Style

If you have a style on your worksheet that you no longer want to use, you can delete the style by deleting the style name. When you delete a style, any cells formatted with that style return to the Normal style. If you added any formats to a cell after the style was applied, these formats remain in the cell when you delete the style.

Deleting a style

1 Choose Format Style.

2 In the Style Name box, select or type the style name you want to delete.

3 Choose the Define button.

The Format Style dialog box expands.

4 Choose the Delete button.

Microsoft Excel deletes the style name, removes the style from any worksheet data, and reverts the worksheet data back to the Normal style. The Format Style dialog box remains open so you can delete other styles.

5 To close the dialog box, choose the Close button.

Changing How Your Worksheet Is Displayed

With Microsoft Excel, you can format the display of your worksheet on the screen. You can control the display of various items such as gridlines and graphic objects. You can also view multiple documents, create multiple windows into the same document, and freeze column and row titles on the screen while scrolling to other parts of the worksheet.

For information on	See
Windows	"Working with Windows" in Chapter 1

Online Help also provides information on changing how your worksheet is displayed. To display online Help, choose the Window Help command. If you are using system software version 7.0 and the Help command does not appear on the Window menu, display Help by pointing to the Help menu icon and choosing the Microsoft Excel Help command. For information on a specific command, select the Commands topic. For information on using online Help, see "Using Help" in Chapter 1.

Controlling the Display of Items on Your Worksheet

With the Options Display command, you can control which items are displayed on your worksheet, including graphic objects. You can also control the color of the gridlines and row and column headings.

When you choose the Options Display command, Microsoft Excel displays the following options:

- **Formulas** Displays the contents of each cell instead of the values produced. This option also left-aligns all cell contents and doubles the width of all columns to accommodate the formulas.
- **Gridlines** Displays worksheet gridlines on your screen. If you don't want gridlines in your printed document, use the File Page Setup command to turn them off.
- **Row & Column Headings** Displays the numbered headings at the left of each row and the lettered or numbered headings at the top of each column. If you don't want row and column headings in your printed document, use the File Page Setup command to turn them off.
- **Zero Values** Controls the display of all zero values. If you turn off this check box, Microsoft Excel displays all zero values as blank cells. This option does not affect cells that have been formatted specifically to show zeros. For more information on formatting numbers, see "Formatting Worksheet Data," earlier in this chapter.

- **Outline Symbols** Displays the outlining symbols if you have created an outline on the worksheet.
- **Automatic Page Breaks** Displays the page breaks that Microsoft Excel sets automatically. If this check box is turned off, automatic page breaks are not displayed. Page breaks that you set with the Options Set Page Break command are always displayed.
- **Show All** Displays all graphic objects—buttons, text boxes, drawn objects, embedded charts, and pictures.
- **Show Placeholders** Displays pictures and embedded charts as gray rectangles for faster scrolling of worksheet. Buttons, text boxes, and all other graphic objects are displayed normally.
- **Hide All** Does not display any graphic objects.
- **Gridline & Heading Color** Sets the gridline and heading color.

Setting your display options

The settings in the Options Display dialog box affect only the active worksheet window when you choose OK.

1. Choose Options Display.
2. Turn on the check box or select the option for the items you want displayed.
3. Choose OK.

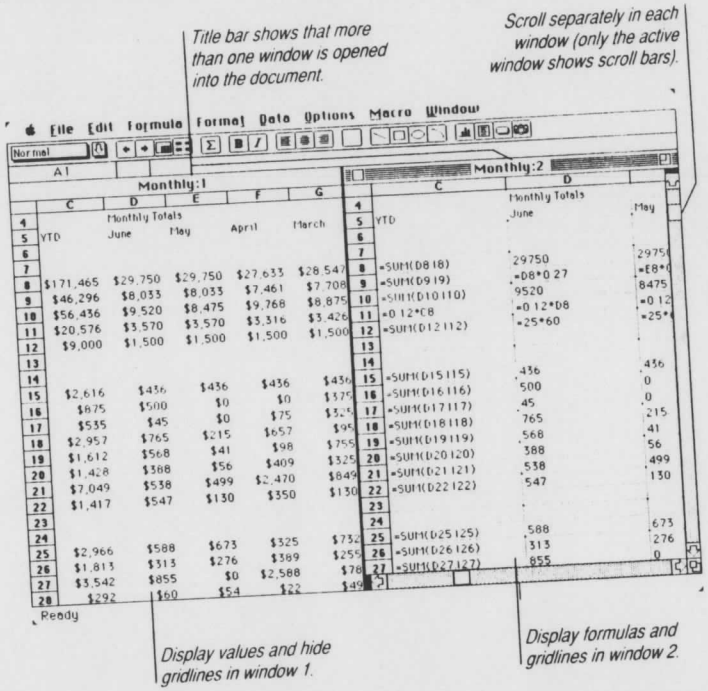
Opening Multiple Windows into a Worksheet

It's often helpful to look at different parts of a large worksheet or macro sheet at the same time. For example, you may want to compare the effects of a "what-if" analysis on widely scattered data on a worksheet. Or, if your worksheet contains a database, you might find it convenient to see your criteria range in a separate window while finding records in the database range.

With the Window New Window command, you can open as many windows as you want into one worksheet. You can move and size multiple windows however you like.

Any change you make in one window of the worksheet takes effect in all other open windows for that worksheet. You see your change in the other window when you scroll each window to the area where the change was made. However, you can set different display options for each window of the worksheet; for example, you can display the worksheet values in one window and its formulas in another.

The following illustration shows two windows into the same worksheet. Note that each window has different display options set:


Title bar shows that more than one window is opened into the document.
Scroll separately in each window (only the active window shows scroll bars).
File Edit Formula Format Data Options Macro Window
Monthly:1
Monthly:2
Monthly Totals
YTD
June
May
April
March
Ready
Display values and hide gridlines in window 1.
Display formulas and gridlines in window 2.

NOTE Opening multiple windows is different from opening a new worksheet with the File New command, which creates a new, separate worksheet. The Window New Window command creates another window into the same worksheet.

Opening a new window into a worksheet

1 Select the window for the worksheet you want.

2 Choose Window New Window.

Displaying All Open Windows in the Workspace

To display all open windows in the workspace, you can use the techniques for moving and sizing windows as discussed in " Working with Windows" in Chapter 1. You also can arrange all open windows so their borders do not overlap or have blank space between them.

Arranging all open windows in the workspace

▶ Choose Window Arrange All.

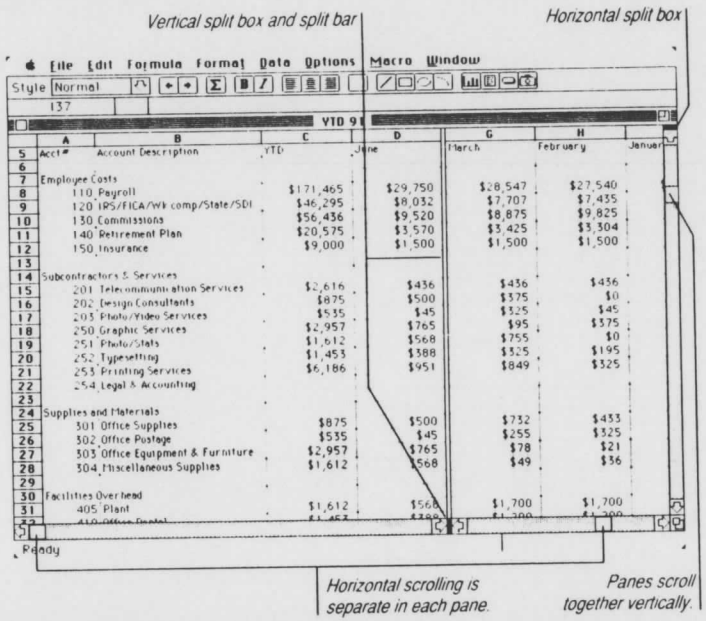
NOTE The Window Arrange All command arranges the visible windows only. You can prevent open windows from being included in the arrangement by hiding them with the Window Hide command before choosing Window Arrange All. For more information on hiding windows, see "Setting Up a Workspace" in Chapter 16.

Splitting a Worksheet Window into Panes

Panes are another way to view different areas of a large worksheet simultaneously. Use panes when you want the different worksheet areas to scroll together vertically or horizontally.

You can split a window into two or four panes—two panes vertically, two panes horizontally, or four panes by splitting the window both vertically and horizontally. With a vertical split, the panes scroll together vertically, and scroll independently horizontally. With a horizontal split, the panes scroll together horizontally, and scroll independently vertically. If you have multiple windows for a single document, each of those windows can have as many as four panes.

The vertical split box is a black box to the left of the horizontal scroll bar. The horizontal split box is a black box at the top of the vertical scroll bar.


Vertical split box and split bar
Horizontal split box
Horizontal scrolling is separate in each pane.
Panes scroll together vertically.

Splitting a window into panes

To display the split boxes, the Scroll Bars check box in the Options Workspace dialog box must be turned on. When you position the mouse pointer on a split box, it turns into a two-way arrow.

1. Activate the worksheet window you want to split.
2. For vertical panes, position the mouse pointer on the vertical split box.

   For horizontal panes, position the mouse pointer on the horizontal split box.
3. Drag the split box until it lines up with the right edge of the column or the bottom edge of the row where you want to split the window.

To move between panes, click the pane you want or press F6.

Removing splits from a window

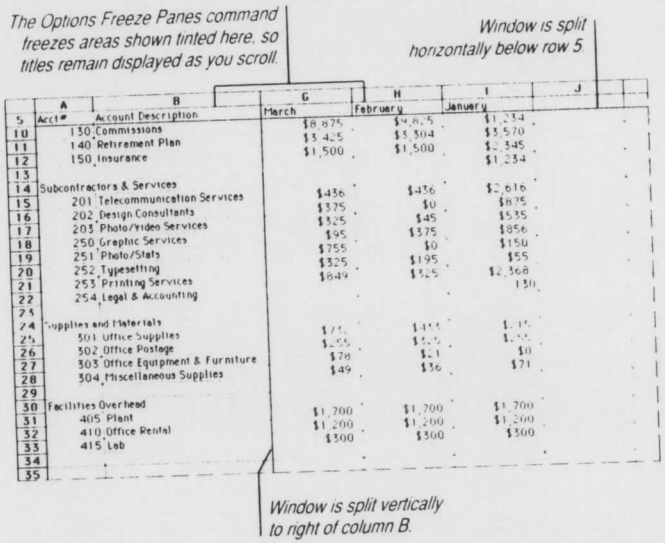
1. Activate the worksheet window from which you want to remove the split.
2. Drag the split bars to the top or left edge of the document window.

Freezing Worksheet Titles

By freezing worksheet titles, you can display designated rows or columns on the screen at all times. This is useful for scrolling through a long worksheet and keeping track of titles that pertain to a given section of the worksheet but are out of the display boundary of the worksheet window.

To freeze titles you use the technique for splitting a window into panes (discussed earlier in this section) in combination with the Options Freeze Panes command. Once you have created top or left panes with the split bars, use the Options Freeze Panes command to lock the top and left panes on the screen. When you choose Options Freeze Panes, panes to the left of a vertical split do not scroll horizontally; panes above a horizontal split do not scroll vertically.

The following illustration shows a worksheet window with frozen panes:


The Options Freeze Panes command freezes areas shown tinted here, so titles remain displayed as you scroll.
Window is split horizontally below row 5.
Window is split vertically to right of column B.

The difference between frozen and unfrozen panes is that with unfrozen panes you can independently scroll the panes above a horizontal split or to the left of a vertical split. With frozen panes, you cannot scroll into the frozen part of the worksheet.

Freezing titles in a column

You can freeze more than one column of titles if the columns are adjoining.

To do this procedure, you must be using full menus.

1 Split the window vertically, placing the split at the right edge of the column that contains the titles you want to freeze.

2 Choose Options Freeze Panes.

Freezing titles in a row

You can freeze more than one row of titles if the rows are adjoining.

To do this procedure, you must be using full menus.

1 Split the window horizontally, placing the split at the bottom edge of the row that contains the titles you want to freeze.

2 Choose Options Freeze Panes.

Freezing both column and row titles

To do this procedure, you must be using full menus.

1 Split the window both vertically and horizontally, placing the splits to the right of the column and below the row that contain the titles you want to freeze.

2 Choose Options Freeze Panes.

Unfreezing titles

When a worksheet window that has frozen titles is active, the Options Freeze Panes command changes to Options Unfreeze Panes.

To do this procedure, you must be using full menus.

1 Select the window.

2 Choose Options Unfreeze Panes.

NOTE If you have opened multiple windows into one worksheet, you can freeze different titles in each window. For information on opening multiple windows, see "Opening Multiple Windows into a Worksheet," earlier in this section.

Printing Your Worksheet

The following section provides a summary of how to print your worksheet. For more detailed information, see Chapter 15, "Printing."

Use the File Print command to print a document. If you are printing a worksheet, you can specify that Microsoft Excel print only the worksheet, only the cell notes, or both. In addition, you can use the File Print command to specify page ranges or to preview the document.

For information on	See
Previewing the printed page	"Previewing Your Pages" in Chapter 15
Options for setting up your printed pages	"Setting Up Your Pages" in Chapter 15
Printing the Info window	"Auditing a Worksheet" in Chapter 6

Online Help also provides information on printing your worksheet. To display online Help, choose the Window Help command. If you are using system software version 7.0 and the Help command does not appear on the Window menu, display Help by pointing to the Help menu icon and choosing the Microsoft Excel Help command. For information on a specific command, select the Commands topic. For information on using online Help, see "Using Help" in Chapter 1.

Printing a worksheet

1 Choose File Print.

2 Type the number of copies you want to print.

3 Select whether you want to print all pages in the print area or a range of pages in the print area. If you want to print a range of pages, type the number of the first page you want in the From box and the last page you want in the To box.

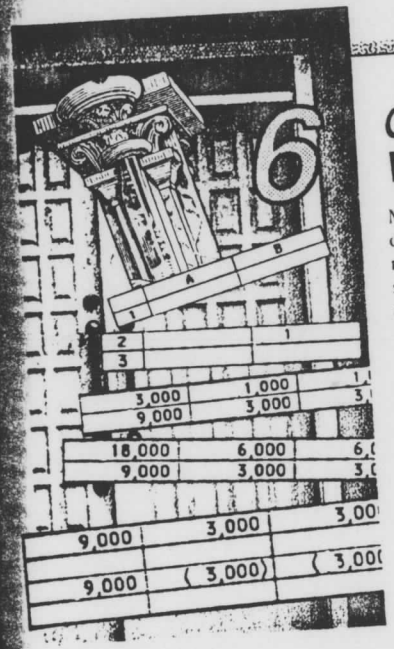
4 To preview the pages and page breaks on the screen before printing, turn on the Print Preview check box.

If the Print Preview check box is turned on, the first page of the document appears in the preview window when you choose OK. You can also preview your document with the File Print Preview command. For more information on the preview window, see "Previewing Your Pages" in Chapter 15.

5 Under Print, select whether you want to print only the worksheet, only the notes from the worksheet, or both.

6 Choose OK.

Microsoft Excel displays a message indicating it is printing your document; if you want to cancel printing, choose COMMAND+PERIOD.



Organizing and Documenting a Worksheet

Microsoft Excel provides many ways for you to organize and document your work so that it's easier to read, understand, maintain, and update. Naming cells and formulas makes worksheets easier to read and reduces errors when you insert, delete, or move data. With outlining, you can collapse or expand parts of a worksheet and work with different levels of detail. By adding notes to a worksheet, you can document your worksheet so that you and others can follow your work more easily. With auditing, you can check your worksheet models to make sure your worksheet is correct.

NOTE Unless otherwise noted, all information and procedures for working with worksheets also apply to macro sheets.

Table of Contents

Naming Cells and Formulas ... 215
Outlining a Worksheet ... 225
Adding Comments to a Worksheet ... 234
Auditing a Worksheet ... 242

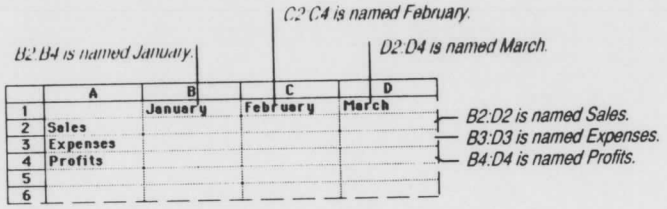
Naming Cells and Formulas

A *name* is an easy-to-remember identifier you create to refer to a cell, a group of cells, or a formula. Formulas using names are easier to read and remember than formulas using cell references—for example, =Assets–Liabilities is easier to read than =F6–D6. By using names in formulas, you also save time later if you need to change the value in the named cell because all formulas using that name are automatically updated.

Online Help also provides information on naming cells and formulas. To display online Help, choose the Window Help command. If you are using system software version 7.0 and the Help command does not appear on the Window menu, display Help by pointing to the Help menu icon and choosing the Microsoft Excel Help command. For information on a specific command, select the Commands topic. For information on using online Help, see "Using Help" in Chapter 1.

Naming Cells

You can choose the Formula Define Name command to name a cell or group of cells. You can also select a range and choose the Formula Create Names command to have Microsoft Excel create names for cells based on row or column names. The following illustration shows how names are created on a sample worksheet when the Top Row and Left Column options are turned on in the Formula Create Names dialog box:


C2:C4 is named February.
B2:B4 is named January.
D2:D4 is named March.
B2:D2 is named Sales.
B3:D3 is named Expenses.
B4:D4 is named Profits.

	A	B	C	D
1		January	February	March
2	Sales			
3	Expenses			
4	Profits			
5				
6				

Naming a cell or range

When you choose the Formula Define Name command to create a name, Microsoft Excel may propose a name from text in the active cell or in the cell above or to the left of the active cell. It also proposes the absolute reference of the current selection as the area to be named.

1 Select the cell, cell range, or multiple selection you want to name.

2 Choose Formula Define Name.

3 In the Name box, type a name or accept the proposed name.

4 In the Refers To box, select a cell or range on the worksheet, type the cell reference, or accept the proposed reference.

When the Refers To box is active, you can scroll through the worksheet and select cells. Microsoft Excel adds the references for you. If you need to select a cell that is hidden by the Formula Define Name dialog box, you can move the dialog box by dragging the title bar with the mouse.

If you type a reference in the Refers To box, it must begin with an equal sign (=), just like a formula.

5 If you are naming cells on a macro sheet, choose the None option.

6 If you want to continue adding names to the worksheet, choose the Add button and repeat steps 3 and 4.

7 Choose OK when you are finished adding names to the worksheet.

Creating several names at once

You can use the Formula Create Names command to create names for columns or rows of data in a selected range. This command creates the names from text in cells in the top or bottom row of the selected range, the left or right column of the range, or any combination of the four. If any of the cells contain numbers formatted as dates, Microsoft Excel creates a name using the formatted appearance of the number.

To do this procedure, you must be using full menus.

1 Select the range you want to name, including the text you want to use for names.

2 Choose Formula Create Names.

3 To name the columns using the text in the top row of the range, turn on the Top Row check box.

To name the columns using the text in the bottom row of the range, turn on the Bottom Row check box.

To name the rows using the text in the left column of the range, turn on the Left Column check box.

To name the rows using the text in the right column of the range, turn on the Right Column check box.

4 Choose OK.

Cells containing the text used as names are not included in the named area.

Deleting a name

Delete a name when you no longer need it or when you have redefined it. Before you delete a name, make sure that formulas using the old name have been edited to include a new name.

1 Choose Formula Define Name.

2 In the Names In Sheet box, select the name you want to delete.

3 Choose the Delete button.

Microsoft Excel leaves the dialog box on the screen so you can delete other names.

4 Choose OK to close the dialog box.

NOTE Choosing Close does not cancel any deletions you have made—it just closes the dialog box. Names you deleted before closing remain deleted.

Editing a name's reference or formula

You can edit a name's reference or formula in the Formula Define Name dialog box. You edit a formula in the Refers To box the same way you edit a formula in the formula bar. For information on naming a formula, see "Naming a Formula," following in this section.

1 Choose Formula Define Name.

2 In the Names In Sheet box, select the name whose reference or formula you want to edit.

Microsoft Excel displays that name in the Name box, and its reference in the Refers To box.

3 In the Refers To box, type a new reference or formula or edit the reference or formula.

4 Choose OK.

Pasting a name into a formula

After you define a name, you can place that name into a formula by typing the name, or you can use the Formula Paste Name command. Pasting a name saves time and helps avoid mistyping names in formulas.

1 In the formula bar, position the insertion point where you want to paste the name.

2 Choose Formula Paste Name.

3 In the Paste Name box, select the name you want to paste.

4 Choose OK.

Applying names to a worksheet

Once you have defined a name, you can use the Formula Apply Names command to scan all or part of a worksheet and replace equivalent references with the name. For example, if you define the name Sales as =$C$12, the Formula Apply Names command replaces all references to cell $C$12 with the name Sales. Applying names to a worksheet is especially useful if you build formulas by pointing to ranges with the mouse.

To do this procedure, you must be using full menus.

1 Select the range in which you want references replaced with names. To apply names to the entire worksheet, select a single cell.

2 Choose Formula Apply Names.

3 In the Apply Names box, select one or more names to be applied.

Microsoft Excel initially selects the last name or names you defined. To select another name, click the name with the mouse, or press the UP ARROW or DOWN ARROW key. To select more than one name, hold down COMMAND and click the names you want to select.

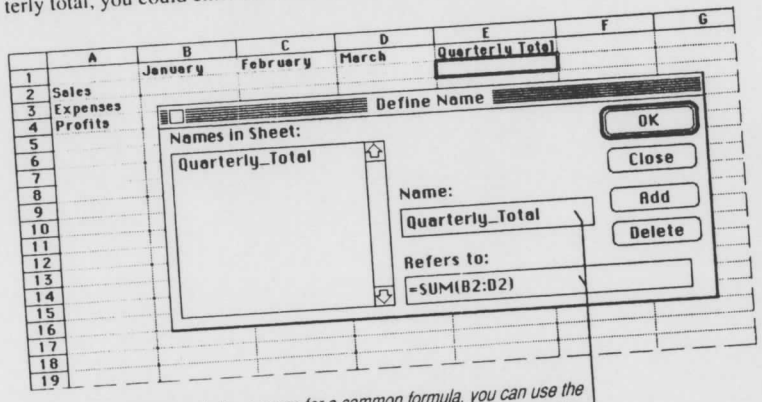
4 Choose OK.

Microsoft Excel replaces cell references with the selected names. For information on the rules Microsoft Excel uses to apply names, see "More About Naming Cells and Formulas," later in this section.

Naming a Formula

In Microsoft Excel, you can name a formula without putting that formula in a cell. This helps reduce the size of your worksheets because Microsoft Excel stores the formula once, instead of in each cell. Later, if you want to change the formula, you change the definition of the formula in the Define Name dialog box, and all cells using the name are automatically updated. If you define a name for a formula, you can include that name in other formulas in the worksheet just as you can with other names.

For example, if all of the quarterly totals in your worksheet are calculated by summing the three columns to the left, you could select cell E1 and use the Formula Define Name command to store the formula =SUM(B1:D1) as the name Quarterly_Total. Then in each place on the worksheet where you needed a quarterly total, you could enter the formula =Quarterly_Total.



When you define a name for a common formula, you can use the name instead of the formula throughout your worksheet, making your worksheet smaller and easier to read.

Naming a formula

Define a name for a formula when you use the same formula in many places throughout a worksheet. Naming formulas is especially useful in formulas using relative references.

1 Choose Formula Define Name.

2 In the Name box, type the name.

3 In the Refers To box, type the formula. Remember to begin the formula with an equal sign.

You can also use the Edit Paste command to paste a formula stored on the Clipboard into the Refers To box, if you copied the formula from the formula bar.

4 Choose OK.

MORE ABOUT

More About Naming Cells and Formulas

Guidelines

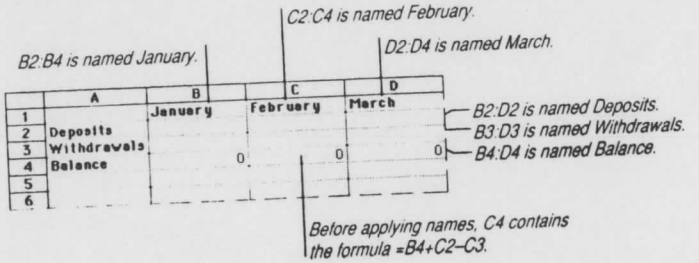
Rules for Names Follow these guidelines for defining a name:

- **Valid characters** The first character must be a letter or an underline character; other characters can be letters, numbers, periods, and underlines. The name cannot look like a reference (such as A$1 or R1C1).
- **Separators** Spaces are not allowed. An underline or a period works well as a word separator.
- **Length of name** A name can be up to 255 characters long.
- **Capitalization** You can use uppercase or lowercase letters. Microsoft Excel does not distinguish between uppercase and lowercase letters in names.

Using Names on Other Worksheets You can also refer to a name you defined on another worksheet. Type the name of the worksheet, an exclamation point (!) and the name defined on that worksheet. For example, you can type **expenses!salaries** to refer to a group of cells named Salaries on the Expenses worksheet.

MORE ABOUT

How Microsoft Excel Applies Names The best way to understand how names are applied is to look at an example. In the following worksheet, the Formula Create Names command was used on the range A1:D4, with both the Top Row and the Left Column options turned on. As a result, the following names were created:



The Deposits and Withdrawals rows will contain constant numbers. The Balance row contains formulas that compute totals. The following table shows how names are applied in the example, depending on the options you choose in the Formula Apply Names dialog box. Choose the Options button in the Formula Apply Names dialog box to display the full dialog box with all of the options.

Use Row and Column Names	Omit Column Name if Same Column	Omit Row Name if Same Row	Formula in C4 becomes
ON	ON	ON	=January+Deposits –Withdrawals
ON	ON	OFF	=January Balance +Deposits –Withdrawals
ON	OFF	ON	=January +February Deposits –February Withdrawals
ON	OFF	OFF	=January Balance +February Deposits –February Withdrawals
OFF	ON or OFF	ON or OFF	=B4+C2–C3

The two names appear in the formula one after the other, separated by a space, which is the intersection operator. For information on operators, see "Entering a Formula" in Chapter 3.

MORE ABOUT

Applying Range Names When the Use Row And Column Names check box is turned on in the Formula Apply Names dialog box, Microsoft Excel uses the names of the ranges containing the cells referred to in the formula if a name for the specific cells cannot be found. References are replaced with the name of the column containing the cell referred to in the formula, the row containing the cell referred to, or both, depending on whether or not the two Omit check boxes are turned on. In the previous example, none of the references in the formula exactly match the definition of a name, so no names would be applied if you turned this check box off. When a cell reference is replaced by both a row-oriented range name and a column-oriented range name, the options under Name Order determine which range name is listed first.

NOTE If the referenced cell is in a different row and column than the cell containing the reference to it, the reference is replaced with the name of both the row-oriented range and the column-oriented range containing the cell, regardless of whether the Omit check boxes are turned on. If the reference is in a different row and column than the cell containing the reference, and the reference does not lie within both a row-oriented named range and a column-oriented named range, the reference is left unchanged, because replacing it with only one name would produce an erroneous name.

Replacing Types of References with Names When the Ignore Relative/Absolute check box is turned on in the Formula Apply Names dialog box, Microsoft Excel replaces references with names regardless of the reference type of either the names or the references. If you turn this check box off, Microsoft Excel replaces a reference only if it is of the same reference type as the name you are applying. If the name refers to an absolute reference, only absolute references are replaced. Likewise, relative reference names replace only relative references, and mixed reference names replace only mixed references.

In the previous example, all of the references in the formula are relative and all of the names are absolute, so no names would be applied if you turned this check box off. Since most worksheets also have mostly relative references and absolute names, it is a good idea to leave Ignore Relative/Absolute turned on unless you plan to copy the cells to another part of the worksheet after you apply the names.

Automatic Translation of Built-in Names Microsoft Excel recognizes built-in names when they are defined in any language Microsoft Excel supports. Built-in names include Auto_Open, Auto_Close, Database, Data_Form, Criteria, Extract, Print_Area, Print_Titles, Recorder, and the built-in style names for outline rows and columns. For example, if you define one of these names in a language other than English and then open the worksheet in the U.S. English version of Microsoft Excel, the name will automatically be translated into English. Likewise, if you define one of these names using the U.S. English version of Microsoft Excel and then open the worksheet in a non-English version of Microsoft Excel, the name is translated into the language of the Microsoft Excel version in use.

MORE ABOUT

Tips

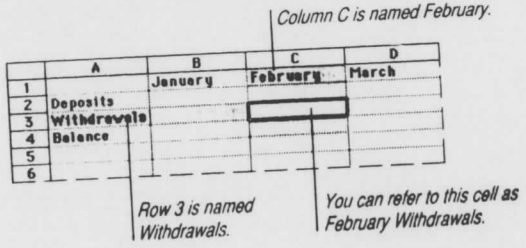
Naming Constant Values You can store a constant value as a name and use it to define global variables for formulas and macros. To store a constant as a name, choose the Formula Define Name command and type the name in the Name box. In the Refers To box, type the number. For example, you could define the name Inflation to be 4%. When you want to change the assumed inflation rate for your whole worksheet, you simply edit the value for Inflation in the Refers To box of the Formula Define Name dialog box. All the formulas using the name Inflation are automatically updated.

When you store constant values as names, be careful you do not hide key assumptions about a worksheet that other people need to find easily. In the previous example, if the inflation rate is a key assumption of your calculations, you should store the value 4% in a cell named Inflation. That way, you could still use the name Inflation in your formulas and people reading your worksheet would know what value you used as your assumed inflation rate.

Moving to Named Cells Quickly You can move to a named cell or select a named range quickly by using the name with the Formula Goto command. You can either select the name from the list of names in the Goto box or type the name in the Reference box.

Scrolling to a Name Quickly To scroll quickly to a name in the Define Name dialog box, you can press the first letter of the name. The list of names scrolls to the first name starting with that letter.

Using Reference Operators with Names You can use the reference operators range (colon), intersection (space), and union (comma) to refer to the range, intersection, and union of named ranges in formulas and in the Reference box of the Formula Goto dialog box. For example, if you have columns named for months, and rows named for categories in a bank statement worksheet, you can go to February's withdrawals by typing **february withdrawals** in the Reference box of the Formula Goto dialog box.



MORE ABOUT

Naming Relative References Microsoft Excel proposes names that refer to cells to be defined as absolute references. The name then points to a specific range of cells on the worksheet, and does not change if you insert and delete data on the worksheet.

However, you can name relative references as a way to simplify formulas and selecting. For example, if you find you have many formulas that sum the three cells to the left of the formula, you could create the name Left_3 to refer to a relative reference of three cells to the left. Then your formula could read =SUM(Left_3). Also, you could select the three cells to the left of the active cell by using the name Left_3 in the Formula Goto dialog box.

Although you can use relative references in defining a name, you should do so with caution, because the actual cells referred to change when a formula using the name is cut or copied. It's easy to lose track of exactly which cells are referred to.

Changing the Type of Reference in a Name If you choose the Formula Define Name command and build a formula in the Refers To box by using the mouse or the ARROW keys, Microsoft Excel adds absolute references, unlike in the formula bar where it adds relative references. You can, however, type a relative reference or change a reference to relative by using the Formula Reference command.

Using Names in Macros When creating macros, you should use names whenever possible. Names make your macros easier to read and reduce the chance of reference errors if data is inserted, moved, or deleted.

Using Hidden Names When writing macros, you can create a name on a sheet that does not appear in the Formula Define Name, Formula Paste Name, or Formula Goto dialog boxes by using the DEFINE.NAME function. Hidden names are useful for storing values or formulas a macro needs but that users of the sheet do not need to see. For information on hidden names, see the DEFINE.NAME function in the *Microsoft Excel Function Reference*.

Troubleshooting

#NAME? Error Value Formulas return the #NAME? error value when a specified name cannot be found. If you receive the #NAME? error value, be sure that you:

- Typed the name correctly.
- Typed the names of the functions in your formula correctly.
- Created the name you are trying to use.
- Did not enclose the name in quotation marks. Microsoft Excel interprets only nonquoted text as a name.
- Did not omit a colon in a range reference. If you type **a1d10** instead of **a1:d10**, Microsoft Excel interprets it as a name.

Outlining a Worksheet

With Microsoft Excel you can give your worksheets an outline structure that can include up to eight levels of information. Outlining works best on worksheets that have many levels of information. For example, you can make monthly sales totals subordinate to quarterly totals in a sales-tracking worksheet, or make individual field measurements subordinate to the measurement averages in engineering reports. With Microsoft Excel you can create an outline from a new or an existing worksheet.

For information on	See
The tool bar	"Creating a New Worksheet" in Chapter 3 and Chapter 14, "Using Graphics on Microsoft Excel Worksheets"
Cell styles	"Formatting with Cell Styles" in Chapter 5

Online Help also provides information on outlining a worksheet. To display online Help, choose the Window Help command. If you are using system software version 7.0 and the Help command does not appear on the Window menu, display Help by pointing to the Help menu icon and choosing the Microsoft Excel Help command. For information on a specific command, select the Commands topic. For information on using online Help, see "Using Help" in Chapter 1.

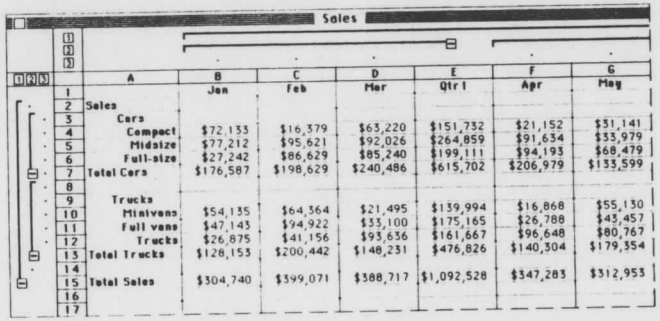
About Outlining

In outlines used in word processing, subordinate levels of information appear below higher levels. In outlines on Microsoft Excel worksheets, subordinate levels of information can appear below, above, or to the right or left of higher levels. Since worksheets have rows and columns, you can outline information both horizontally and vertically.

Once you have created an outline on your worksheet, you can collapse and expand rows and columns to hide and display subordinate data. This simplifies reorganizing data on your worksheet and makes it easy to move through large amounts of data quickly.

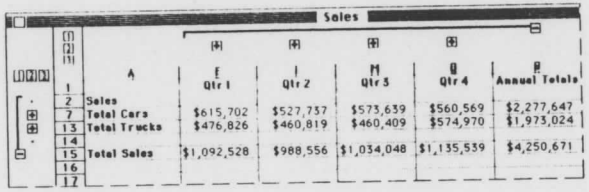
After you have hidden rows or columns by collapsing parts of your outline, you can select the visible cells in your outline as if they were a single range of cells by using the select visible cells button in the tool bar or the Formula Select Special command. You can then format or copy the visible cells you selected. When you copy visible cells, you can use the chart tool or the File New command to make a chart of the visible cells, or you can use the Edit Paste, Edit Paste Special, or Edit Paste Link commands to paste the visible cells you copied.

For example, on a worksheet that tracks sales for an automobile dealer, you could make rows of sales data about different types of cars and trucks subordinate to the total sales of cars and trucks. You could also make the columns of monthly sales totals subordinate to the columns of quarterly sales totals. Once you had outlined the worksheet, you could select and chart the quarterly sales totals as if they were one range of cells, and not noncontiguous cells, by using the select visible cells button in the tool bar or the Formula Select Special command. The following illustration shows a worksheet with outlining applied:



	A	B Jan	C Feb	D Mar	E Qtr 1	F Apr	G May
2	Sales						
3	Cars						
4	Compact	$72,133	$16,379	$63,220	$151,732	$21,152	$31,141
5	Midsize	$77,212	$95,621	$92,026	$264,859	$91,654	$33,979
6	Full-size	$27,242	$86,629	$85,240	$199,111	$94,193	$68,479
7	Total Cars	$176,587	$198,629	$240,486	$615,702	$206,979	$133,599
8							
9	Trucks						
10	Minivans	$54,135	$64,364	$21,495	$139,994	$16,868	$55,130
11	Full vans	$47,143	$94,922	$33,100	$175,165	$26,788	$43,457
12	Trucks	$26,875	$41,156	$93,636	$161,667	$96,648	$80,767
13	Total Trucks	$128,153	$200,442	$148,231	$476,826	$140,304	$179,354
14							
15	Total Sales	$304,740	$399,071	$388,717	$1,092,528	$347,283	$312,953
16							
17							

Now, look at the same worksheet with the subordinate sales data and monthly sales totals collapsed:

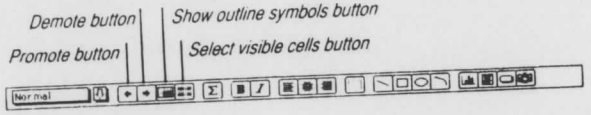


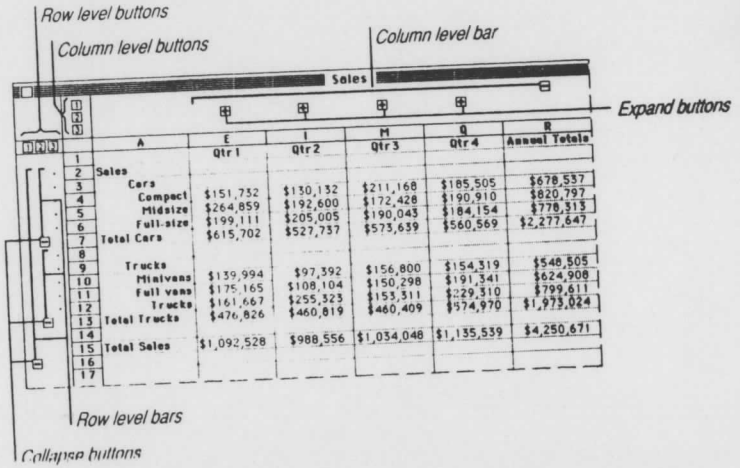
	A	E Qtr 1	I Qtr 2	M Qtr 3	Q Qtr 4	R Annual Totals
2	Sales					
7	Total Cars	$615,702	$527,737	$573,639	$560,569	$2,277,647
13	Total Trucks	$476,826	$460,819	$460,409	$574,970	$1,973,024
14						
15	Total Sales	$1,092,528	$988,556	$1,034,048	$1,135,539	$4,250,671
16						
17						

The formatting of various levels in an outline can be controlled through cell styles, giving your outline a clear, consistent appearance.

The Parts of the Outline Display

The following illustrations show the tool bar buttons used with outlining and the parts of the outline display:





	A	E Qtr 1	I Qtr 2	M Qtr 3	Q Qtr 4	R Annual Totals
2	Sales					
3	Cars					
4	Compact	$151,732	$130,132	$211,168	$185,505	$678,537
5	Midsize	$264,859	$192,600	$172,428	$190,910	$820,797
6	Full-size	$199,111	$205,005	$190,043	$184,154	$778,313
7	Total Cars	$615,702	$527,737	$573,639	$560,569	$2,277,647
8						
9	Trucks					
10	Minivans	$139,994	$97,392	$156,800	$154,319	$548,505
11	Full vans	$175,165	$108,104	$150,298	$191,341	$624,908
12	Trucks	$161,667	$255,323	$153,311	$229,310	$799,611
13	Total Trucks	$476,826	$460,819	$460,409	$574,970	$1,973,024
14						
15	Total Sales	$1,092,528	$988,556	$1,034,048	$1,135,539	$4,250,671
16						
17						

- **Promote button** Use this button to raise selected rows or columns to a higher level in an outline.
- **Demote button** Use this button to move selected rows or columns to a lower level in an outline. To create an outline manually, you begin by demoting a level.
- **Select visible cells button** Use this button to select the visible cells in an outline range. You can work with just the visible cells to chart or copy only a specific level of information.

- **Show outline symbols button** Use this button to display or hide the outlining buttons and symbols on your worksheet.
- **Expand button** This button indicates collapsed rows or columns. Click the expand button to display collapsed levels.
- **Collapse button** This button indicates that demoted rows or columns are displayed. Click the collapse button to hide the rows or columns indicated by the column or row level bar.
- **Row and column level buttons** These buttons indicate the number of row and column levels in an outline. Click them to display specific levels of data in an outline. For example, in an outline with three levels of data, clicking the second level button displays information for levels one and two.
- **Row and column level bars** These bars indicate that all detail rows and columns are displayed. To hide the detail rows and columns, click the collapse button at the end of the level bar, or click the level bar.

Creating an Outline

You can create an outline on a new or an existing worksheet. Outlining makes it easy to move through many rows of data, rearrange parts of a worksheet, and create charts from similar levels of data from different parts of a worksheet. To create an outline, references in your formulas must consistently point in one direction, such as rows always referring up and columns always referring left. You can have only one outline at a time on a worksheet.

Creating an outline

You can turn an existing worksheet or range into an outline using the Formula Outline command. You can also create an outline manually by selecting rows or columns and clicking the demote button in the tool bar. Once an outline is created, you can use the outline buttons and symbols to work with the data. Use the following procedure to create an outline automatically.

To do this procedure, you must be using full menus.

1 Select the range you want to outline.

If you select a single cell, Microsoft Excel assumes you want to outline the entire worksheet.

2 Choose Formula Outline.

3 Choose the Create button.

Microsoft Excel outlines your worksheet and automatically displays the outline symbols for you.

Displaying or hiding the outline buttons and symbols

Outline buttons and symbols are automatically displayed when your worksheet contains two or more levels of outlined data. You can control whether the outline buttons and symbols are displayed—outlining can still be used without the outlining buttons and symbols displayed. However, it's much easier to use outlining with the buttons and symbols displayed.

▶ Click the show outline symbols button in the tool bar.

1 Choose Options Display.

2 To display outline symbols, turn on the Outline Symbols check box.

To hide outline symbols, turn off the Outline Symbols check box.

3 Choose OK.

Clearing an outline from a worksheet

If you no longer want to use outlining on a worksheet, you can clear the outline. Clearing an outline does not affect the data on your worksheet. You clear an outline to remove the outline structure only. Clearing an outline is useful if you've made a mistake and want to start over again.

1 Select the entire outline.

2 Click the promote button in the tool bar or press COMMAND+SHIFT+J until all rows and columns are at level one. The outline symbols disappear and your worksheet no longer contains an outline.

Working with an Outline

Once you have created an outline, you can use it to hide, display, move, or copy levels of information. You can also control automatic formatting for summary rows and columns in your outline.

Demoting a row or column

You move rows or columns to a lower level in an outline by demoting them. If you are creating an outline manually, you must start by demoting a row or column.

1 Select the entire row or column you want to demote.

2 Click the demote button in the tool bar.

If you did not select an entire row or column, Microsoft Excel displays a dialog box asking whether you want to demote rows or columns.

1 Select the entire row or column you want to demote.

2 Press COMMAND+SHIFT+K.

If you did not select an entire row or column, Microsoft Excel displays a dialog box asking whether you want to demote rows or columns.

If Automatic Styles are turned on in the Formula Outline dialog box, Microsoft Excel applies the appropriate row or column heading style to the summary row or column of the data you demoted.

Promoting a row or column

You raise rows or columns to a higher level in an outline by promoting them.

1 Select the entire row or column you want to promote.

2 Click the promote button in the tool bar.

If you did not select an entire row or column, Microsoft Excel displays a dialog box asking whether you want to promote rows or columns.

1 Select the entire row or column you want to promote.

2 Press COMMAND+SHIFT+J.

If you did not select an entire row or column, Microsoft Excel displays a dialog box asking whether you want to promote rows or columns.

Collapsing a level

You can hide the data subordinate to a level in your outline. This is useful for displaying and charting summary information from a complex worksheet.

▶ Click the collapse button or the level bar for the data you want to hide.

NOTE When you collapse a level, you are actually hiding rows or columns in your worksheet. Microsoft Excel does not differentiate between rows or columns hidden by outlining and rows or columns hidden by the Format Row Height command, the Format Column Width command, or by dragging row or column gridlines. For example, if you manually hide a row or column and use the outlining buttons to hide all rows or columns of a certain level, and then display all rows or columns in that level, Microsoft Excel displays the row or column you hid manually.

Expanding a level

If a row or column in an outline has an expand button next to it, you can expand that row or column to see the levels hidden under it. This lets you see the detailed information behind sums or averages.

▶ Click the expand button for the data you want to show.

Displaying specific levels of an outline

By using the row and column level buttons, you can display certain levels of data in an outline. These buttons allow you to display or hide all information of a related type. For example, you could display levels 1 through 3 of an outlined sales worksheet to see the annual, quarterly, and monthly sales totals.

▶ To display a specific level of rows or columns, click the row or column level button.

To display all levels of rows or columns, click the level button for the outline's lowest level.

For example, to display levels 1 through 3, click the third level button.

Selecting part of an outline

You can select a row or column in an outline including all of its detail rows or columns. This makes it easy to copy, cut, move, and chart levels within an outline.

▶ Hold down the SHIFT key and click the collapse or expand button or the level bar for the row or column.

Selecting visible cells in an outline

When you select a range in your outline that includes collapsed rows or columns, you are selecting the cells you see on your screen and the cells hidden in the collapsed rows or columns. If you then copy the selected cells or make a chart of them, you would be copying or charting the hidden cells as well as the visible ones. However, by using the select visible cells button in the tool bar or the Formula Select Special command you can work with just the visible cells you select to chart or copy only a specific level of information.

For example, if you want to chart just the quarterly sales totals for an automobile dealer, you could collapse an outlined worksheet to display only the quarterly totals, select the totals, and use the select visible cells button or the Formula Select Special command to select only the visible cells within your selected range.

1 Select the cells in your outline you want to work with.

2 Click the select visible cells button in the tool bar or choose Formula Select Special.

3 If you chose Formula Select Special, select the Visible Cells Only option.

4 Chart or copy the cells as you normally would.

NOTE If the paste area contains collapsed rows or columns, Microsoft Excel pastes the copy area into consecutive rows or columns even if they are not visible. You may need to expand the paste area to see all of the copied cells.

Controlling automatic outline styles

Microsoft Excel includes built-in cell styles for the summary rows and columns of an outline. You can have Microsoft Excel automatically apply these styles to rows and columns when you promote them or demote them. Later, if you want to change the formatting for a level in an outline, you can change the style for that level and all the cells assigned that style are reformatted.

1. Choose Formula Outline.
2. To have Microsoft Excel apply styles automatically, turn on the Automatic Styles check box.

   To stop having styles applied automatically, turn off the Automatic Styles check box.
3. Choose OK.

NOTE Microsoft Excel applies outlines to entire rows or columns. Data outside the outline area, but in the outline row or column, will have the same style as the outline data in that row or column.

Once automatic styles are applied, the style list in the tool bar displays the built-in style names used in the outline. Microsoft Excel does not have built-in styles for detail rows and columns. However, you can create your own styles for detail information. For more information on cell styles, see "Formatting with Cell Styles" in Chapter 5.

Applying styles to an existing outline

You can easily apply styles to an existing outline that does not currently use them. This is useful if you had Automatic Styles turned off when you created your outline and now you want to use styles to format your outline. Later, if you want to change the formatting for a level in an outline, you can change the style for that level and all the cells assigned that style are reformatted.

1. Select the outline or cells within the outline.
2. Choose Formula Outline.
3. Choose the Apply Styles button.

Styles are applied to the summary rows and columns of your outline. For information on cell styles, see "Formatting with Cell Styles" in Chapter 5.

MORE ABOUT

More About Outlining a Worksheet

Guidelines

Setting Up Data for Outlining When you use outlining, your formulas should have a consistent direction of referencing; that is, all references should consistently refer to cells in one direction: to the right, left, above, or below the cell containing the reference. You can use a different direction of reference in columns than in rows, as long as you are consistent within rows and within columns.

How Microsoft Excel Creates Outlines Automatically When you use the Formula Outline command to outline a worksheet, Microsoft Excel examines the following properties of your worksheet or selected range to determine how to assign levels within the outline:

- **Formulas** Microsoft Excel examines the types of formulas used in the outline area to determine row and column levels. Mainly, Microsoft Excel looks for references to ranges of cells directly adjacent to the cell containing the formula, especially ranges directly above or to the right.
- **Direction of references** Microsoft Excel examines which direction references point to in determining the relationships between levels in an outline.

Tips

Hiding Individual Rows and Columns To hide or display individual rows or columns within a level, use the Hide and Unhide buttons in the Format Row Height and Format Column Width dialog boxes.

Collapsing or Expanding Large Sections of an Outline You can click a row or column level bar to collapse or expand the row or column. By using the level bars, you can work with sections of an outline that extend beyond the visible area of your worksheet on the screen.

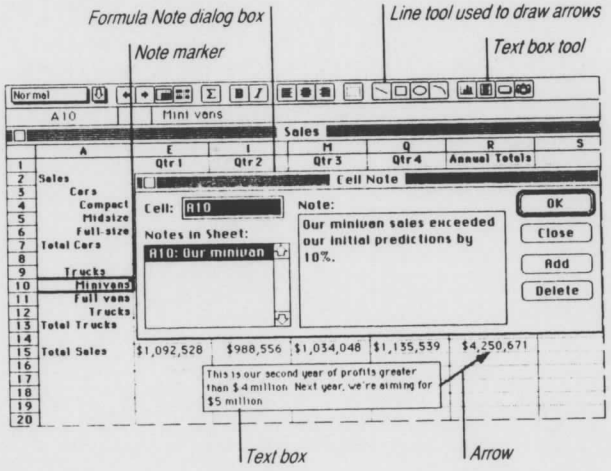
Rearranging Parts of an Outline You can rearrange rows and columns in an outline as you do any rows or columns in a worksheet. To move rows and columns, collapse the rows or columns, hold down SHIFT, and click the expand button before copying. Then when you copy a collapsed row or column, all the levels under it are also copied.

MORE ABOUT

Consolidating Data from an Outline If you want to consolidate using only a specific level of information from an outline, first expand or collapse parts of the outline to display the level of data you want. Select the visible cells using the select visible cells button in the tool bar or choose the Formula Select Special command and turn on the Visible Cells Only check box, and then choose the Edit Copy command. Choose the Edit Paste Link command to paste the selected cells into another range or worksheet. The new range is now linked to the outline, and contains the data you want. You can now use this range as part of your consolidation. For information on consolidation, see "Consolidating Data from Multiple Worksheets" in Chapter 8.

Adding Comments to a Worksheet

Text boxes and notes can be used to document data sources, explain the underlying assumptions of a worksheet model, or detail the way macros work. They can act as personal reminders and as quick reference aids for others who use your model. You can use *text boxes* to display comments next to parts of your worksheet or macro sheet. With the line tool, you can draw arrows from text boxes to the cells described in the text box. You can also attach a comment to a cell in a worksheet by using a *note*. Notes are not displayed on the worksheet, but are attached to the cell so they are copied or moved with the cell. You can have Microsoft Excel display a marker in each cell that contains a note.



For information on	See
The tool bar	"Creating a New worksheet" in Chapter 3 and "Working with and Formatting Graphic Objects" in Chapter 14

Online Help also provides information on adding comments to a worksheet. To display online Help, choose the Window Help command. If you are using system software version 7.0 and the Help command does not appear on the Window menu, display Help by pointing to the Help menu icon and choosing the Microsoft Excel Help command. For information on a specific command, select the Commands topic. For information on using online Help, see "Using Help" in Chapter 1.

Adding and Editing Text Boxes

To add comments or informational notes to your document, you may want to create blocks of text that you can position and format independently of the worksheet or macro sheet cells. Using the text box tool in the tool bar, you can add text boxes that can be moved, sized, and formatted as independent graphic objects. You can enter any text you want in a text box—it will automatically wrap to the width of the text box.

You can format any characters in a text box and you can change the alignment and orientation of all the text. You can also format the text box border and add a fill pattern. For information on formatting a text box, see "Working with and Formatting Graphic Objects" in Chapter 14.

NOTE You cannot create text boxes on charts created as separate documents. If you want to use a text box on a chart, create the chart on a worksheet. For information on creating charts on a worksheet, see "Creating a New Chart" in Chapter 11.

Adding a text box

1. Click the text box tool in the tool bar.

   To draw more than one text box without having to reselect the text tool each time, hold down COMMAND and click the text tool.

2. Position the cross-hair pointer where you want one corner of the box located.
3. To make the text box a square, hold down SHIFT.

   To align the text box to the cell grid, hold down COMMAND.

4. Drag until the box is the size and shape you want.

   If you held down COMMAND when you clicked the text box tool, repeat steps 2 through 4 to create additional text boxes.

5 Type the text you want in the box. To start a new line, press ENTER.

Text automatically wraps to fit the width of the box.

If you created more than one text box, click the next text box to select it and type the text you want in the box. Repeat this step for each text box.

6 When you are finished, click outside the text box.

Editing the text in a text box

1 Click the text box to select it.

If the insertion point is in the text box, you can start editing without selecting the text box.

2 Position the insertion point and edit the text using the same techniques as for editing worksheet data. For information on editing data, see "Editing Worksheet Data" in Chapter 3.

If you start typing without positioning the insertion point in the text box, all the text in the box is automatically replaced with the new text.

NOTE If the text in a text box is rotated vertically, Microsoft Excel shifts the text horizontally when you click inside it with the I-beam pointer. When you finish editing, click outside the text box to return the text to its original orientation.

Formatting the font used in a text box

You can change the font, size, style, and color of text in a text box. Unlike formatting text in a worksheet or macro sheet cell, you can format characters separately rather than using only one format for the entire entry. You can change the format as you are typing, or you can select characters and format them after entering the text.

1 Select the characters you want to format, or position the insertion point where you want to change to a different format. Any characters you type following the insertion point will use the format you choose.

To format all the text in the text box, click the text box to select it.

2 Choose Format Font.

3 In the Font box, select the font you want. Under Sample, Microsoft Excel shows you what the new formatting will look like.

If the font you want is not listed, type the font name in the box below the Font box.

4 In the Size box, select the font size you want.

If the font size you want is not listed, type the size in the box below the Size box.

5 Under Style, turn on or turn off the check boxes to set the styles as you want them.

6 In the Color box, select a color.

To set the color to the system font color, select the Automatic option.

7 Choose OK.

NOTE If you only want to change whether the text is bold or italic, you can click the bold or italic buttons in the tool bar instead of choosing the Format Font command.

Formatting the alignment of text in a text box

You can change the horizontal and vertical alignment of text in a text box and you can rotate the text to a vertical orientation. You can also choose whether or not the text box automatically changes size to fit the text or stays the same size until you change it.

1 Select the text box.

2 Choose Format Text.

3 Under Horizontal, select the horizontal alignment you want.

4 Under Vertical, select the vertical alignment you want.

5 If you want the text box size to adjust automatically to fit the text, turn on the Automatic Size check box. Once you size the text box yourself, Automatic Size is turned off.

If you want the text box size to remain fixed until you change it, turn off the Automatic Size check box.

6 If you want to rotate the text, select the orientation you want under Orientation.

7 Choose OK.

Drawing an arrow

You can use the line drawing tool to draw an arrow from a text box to the cell or range it describes. By combining arrows with text boxes, you can call attention to different parts of your worksheet.

1 Click the line drawing tool in the tool bar.

2 Position the cross-hair pointer where you want one end of your arrow.

3 Drag the mouse to where you want the other end of your arrow.

4 Double-click the line.

The Format Patterns dialog box appears.

5 Select the line style, color, weight, and arrowhead options you want.

6 Choose OK.

Deleting a text box or arrow

You can delete a text box or arrow when you no longer want it on your worksheet.

1. Click the text box or arrow to select it.
2. Choose Edit Clear.

NOTE If text is selected in a text box, only that text is deleted when you choose the Edit Clear command.

Using Notes

Use notes when you don't want to display comments on your worksheet or when you want to print comments separately from the cells on a worksheet.

Creating a note

You can create a note for any cell that needs additional explanation or contains a complex formula. For example, for a cell that contains a formula to calculate interest on a loan, you could attach a note with the bank's address and phone number.

1. Select the cell you want to add a comment to.
2. Choose Formula Note.

   The flashing insertion point indicates that the Note box is the active area.
3. In the Note box, type the text of the note.

   The text you type wraps to the next line automatically. Do not press ENTER (RETURN) to insert a line break. To insert a line or paragraph break, press OPTION+ENTER (RETURN).
4. Choose OK.

Microsoft Excel attaches the note to the cell, along with its cell reference. If you want to, you can change the reference in the Cell box in the Formula Note dialog box by typing in a new reference or by using the mouse or ARROW keys to select another cell. You can edit a note, using the same techniques used for editing worksheet data. For information on editing on a worksheet, see "Editing Worksheet Data" in Chapter 3.

Creating multiple notes quickly

If you want to attach notes to several cells, you can leave the Formula Note dialog box open and create multiple notes at one time. When the Cell box is active, you can select a cell or type in the cell reference.

1. Select the first cell you want to add a comment to.
2. Choose Formula Note.
3. In the Note box, type the text of the note.
4. Choose the Add button.

   Microsoft Excel attaches the note to the cell and lists the cell reference and first few words of the note in the Notes In Sheet box.
5. Select the next cell you want to add a comment to or type the reference in the Cell box.

   If you need to view a cell behind the dialog box, you can move the dialog box by dragging the title bar with the mouse.
6. Move to the Note box.
7. Delete the text from the previous note and type the text of the next note.
8. Choose the Add button.
9. Repeat steps 5 through 8 for each additional note you want to create.
10. Choose OK when you are finished adding notes.

Displaying or hiding note markers

With Microsoft Excel you can display a marker in each cell that has a note attached to it. This helps you quickly find the cells with notes. Note indicators are not printed when you print a worksheet.

1. Choose Options Workspace.
2. To display note markers in cells, turn on the Note Indicator check box.

   To stop displaying note markers in cells, turn off the Note Indicator check box.
3. Choose OK.

Viewing a note

You can view the contents of any note or see a list of the notes in the worksheet.

1 Double-click the cell containing the note or choose Formula Note.

A list of all notes appears in the Notes In Sheet box; use the scroll bar to scroll through the list.

2 To view a particular note, select it in the Notes In Sheet box.

The note text appears in the Note box.

3 Choose the Close button when you are finished viewing the notes.

Viewing all notes in a worksheet

You can read all the notes in a worksheet by combining the Formula Select Special command with the Info Window. Use this procedure when you want to familiarize yourself with a new worksheet that contains notes, or when you want to find a particular note. For more information on using the Info window, see "Auditing a Worksheet," later in this chapter.

1 Choose Window Show Info.

2 Choose Window Arrange All to arrange your screen so you can see the worksheet and the Info Window simultaneously.

3 Activate the worksheet.

4 Choose Formula Select Special.

5 Select the Notes option.

6 Choose OK.

7 Move from cell to cell. The note for each cell appears in the Info Window.

Printing notes

You can print cell notes either with or without their accompanying worksheet. If you specify that both the worksheet and notes be printed, Microsoft Excel first prints the worksheet, followed by the notes. If you have previously specified a print area (a section of a worksheet you want to print), Microsoft Excel prints notes for cells in the print area only.

1 Choose File Page Setup.

2 To print notes with cell references before each note, turn on the Print Row And Column Headings check box.

To print notes without cell references before each note, turn off the Print Row And Column Headings check box.

3 Choose OK.

4 Choose File Print.

5 To print only the notes, select the Notes option.

To print the worksheet and its notes, select the Both option.

6 Choose OK.

Deleting a note

You can delete notes when they are no longer needed.

1 Select the cell or cells whose notes you want to delete.

2 Choose Edit Clear.

3 Select the Notes option.

4 Choose OK.

More About Adding Comments to a Worksheet

MORE ABOUT

Tips

Copying Text Into a Text Box In addition to typing text in a text box, you can also copy text from the formula bar and paste it into a text box. Select the cell containing the text you want to copy, select the text in the formula bar, and choose the Edit Copy command. Then, position the insertion point in the text box where you want the characters inserted and choose the Edit Paste command. If you select characters in the text box before pasting, the selected characters are replaced by the pasted characters. For more information on copying, see "Moving and Copying Data and Formats," in Chapter 4.

Creating a Text Box While Pasting Data You can create a new text box by selecting any graphic object and choosing the Edit Paste command when the Clipboard contains data copied from the formula bar.

If, instead of copying data from the formula bar, you copy a cell or range and then select a graphic object and choose the Edit Paste command, Microsoft Excel pastes a picture of the cell or range on the worksheet. The picture is similar to that created by the Edit Copy Picture command.

Printing Notes from the Info Window You can create Info window printouts for selected cells in a worksheet. Select the range with the notes you want to print, choose the Window Show Info command or activate the Info window and then choose the File Print command. An Info window printout can contain any or all of the types of data you display in the Info window for each cell. For information on using the Info window, see the following section, "Auditing a Worksheet."

Auditing a Worksheet

Microsoft Excel provides many tools to help you check your worksheet to make sure it's accurate:

- **Applying names** You can apply names to ranges of cells on a worksheet to identify groups of cells easily. Names make it easier to read a worksheet and to understand the logic behind it.
- **Finding error values** With the Formula Select Special command, you can find cells that produce error values. Microsoft Excel uses seven different error values to indicate errors such as division by zero or use of unrecognized names. All error values begin with a number sign (#), so you can also search for error values with the Formula Find command.
- **Finding changes in your model** The Formula Select Special command provides ways to find cells that don't fit the pattern of the rest of the worksheet. For example, by selecting the Row Differences or Column Differences options you can find cells that differ from row to row or column to column when they should be similar.
- **Documenting with cell notes** With notes you can document your worksheet models. You can check cell notes for information such as sources of data, the accuracy of numbers, and so on.
- **Examining the relationships between cells** By using the Info window and the Formula Select Special command either separately or together, you can track the relationships between formulas and their precedent and dependent cells.
- **Finding information about circular references** Microsoft Excel tells you if you accidentally create a circular reference in your worksheet, so you can determine if a formula is referring to itself. The status bar displays the reference of the cell or cells containing the circular reference.
- **Getting a visual overview of large documents** With the File Print Preview command, you can see a reduced version of a document. This gives you a larger perspective on the overall flow of your worksheet.
- **Viewing detailed information about cells** With the Info window, you can see information about the active cell, such as the formula contained in the cell, the value the formula produces, the format of the cell, the cell's protection status, the cell's precedents and dependents, and more.

This section includes information on using the Info window and the Formula Select Special command to check your worksheet and explains how to check names.

For information on	See
Working with names	"Naming Cells and Formulas" earlier in this chapter
Documenting a worksheet	"Adding Comments to a Worksheet" preceding in this chapter
Selecting specific cells quickly	"Selecting Cells and Moving Around the Worksheet" in Chapter 3
Previewing a document	"Previewing Your Pages" in Chapter 15
Finding specific cells	"Finding and Replacing Cells and Data" in Chapter 4

Viewing Detailed Information About Cells

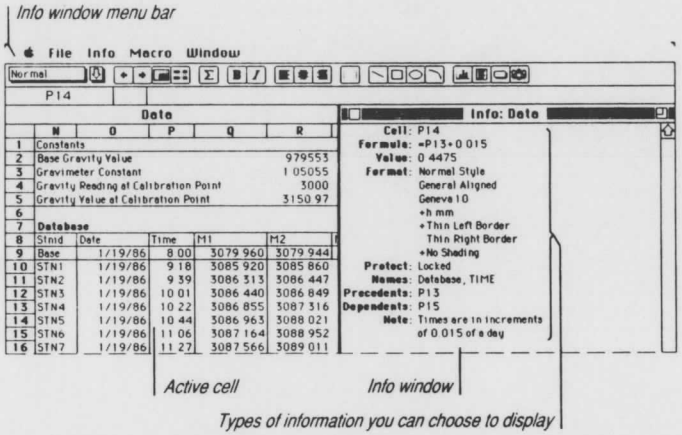
You can see detailed information about the active cell with the Info window. You can specify exactly which types of information you want to see in the Info window using the Info menu that appears when the Info window is active.

Since you can quickly see details in the Info window, it's especially useful for the following tasks:

- **Finding errors in a worksheet** You can use the Info window to find and correct errors. For example, you can verify a formula used in a cell, or the cell's protection status.
- **Locating cell information quickly** You can use the Info window with the Formula Select Special command to quickly locate specific cell information, such as cell notes or cell precedents and dependents, and then use the Info window to scan through the cell notes or precedents and dependents of the selected cells.

Open the Info window whenever you want to look up details about a specific cell or keep the Info window displayed while you work so you can monitor the underlying contents of your worksheets and macro sheets. You can also print the Info window with all the information listed in the Info window.

In the following illustration, the Info window is set up to display all types of available information:



When the Info window is active, Microsoft Excel displays a different set of menus. The Info menu contains the commands you use to display different types of information in the Info window.

When you choose one of the commands in the Info menu, a check mark appears next to the command and the associated information appears in the Info window. Choosing the command again removes the check mark from the command and the information from the Info window. The following commands control the display of information in the Info window:

- **Cell** Displays the cell reference of the active cell.
- **Formula** Displays the contents of the active cell as displayed in the formula bar.
- **Value** Displays the value produced by the contents of the active cell.
- **Format** Lists the format settings of the active cell, including the number, alignment, font, border, and shading formats.
- **Protection** Displays the protection status of the active cell. An individual cell can be locked or its formula hidden.
- **Names** Displays the names of any named areas that include the active cell.

- **Precedents** Lists the cells used in the formula in the active cell. For example, if the active cell's formula is =A2+A3, the direct precedents are A2 and A3.
- **Dependents** Lists the cells with formulas that depend on or refer to the active cell. For example, if A1 is the active cell and the formula for A2 is =A1+A4, then A2 is a dependent of A1 and A4.
- **Note** Displays the note, if any, attached to the active cell.

Opening the Info window

When you first open the Info window, it displays three types of information about the active cell: the cell reference, the formula, and any notes attached to the cell.

To do this procedure, you must be using full menus.

▶ Choose Window Show Info.

The Info window opens on the right side of your worksheet. You can move or size the Info window as you would with any other window, or you can have Microsoft Excel arrange the windows for you with the Window Arrange All command.

Displaying information in the Info window

You can modify the types of information displayed by choosing commands from the Info menu.

To do this procedure, you must be using full menus.

1 Choose Window Show Info.

2 With the Info window active, choose the Info menu command for the type of information you want to display.

Microsoft Excel places a check mark next to the command.

3 Repeat step 2 for each type of data you want displayed.

Removing information from the Info window

To do this procedure, you must be using full menus.

1 Choose Window Show Info.

2 With the Info window active, choose the Info menu command for the type of information you want to remove.

Microsoft Excel removes the check mark next to the command.

3 Repeat step 2 for each type of data you want removed.

Working with the Info window displayed

By moving and sizing windows, you can arrange the Info window and any open document windows so that all windows are visible in the workspace. You can also automatically arrange the Info window and any open document windows so that all open windows are visible in the workspace.

To do this procedure, you must be using full menus.

1 Choose Window Show Info.

2 Choose Window Arrange All.

Switching between the Info window and the worksheet

You can keep the Info window open without displaying it in the workspace. Use the following procedure to switch between the active document window and the Info window if the open windows overlap in the workspace:

▶ To switch to the document window from the Info window, choose Window Show Document.

To switch to the Info window from the active document window, choose Window Show Info.

Use the following procedure to switch between the worksheet window and the Info window when both windows are showing:

▶ Click the window you want to activate.

▶ Press COMMAND+6.

Printing Info window information for a selected range of cells

The Info window displays information for the active cell only; however, you can print the Info window information for a cell range.

To do this procedure, you must be using full menus.

1 Choose Window Show Info.

2 Choose the Info window commands for the information you want to print.

3 Activate the worksheet window.

4 Select the cells for which you want to print the Info window information.

5 Activate the Info window.

6 Choose File Print.

7 Choose OK.

Microsoft Excel prints the Info window information for all cells currently selected in the worksheet window.

NOTE You can also use other worksheet printing options for Info window printouts. For example, you can preview the document before printing or specify a different printer. For more information, see Chapter 15, "Printing."

Closing the Info window

Click the close box in the upper-left corner of the Info window.

1 Activate the Info window.

2 Choose File Close or press CTRL+F4.

Checking Cells by Selecting Specific Types of Contents

You can select all of the cells with specific types of cell contents. Use the Formula Select Special command to make a multiple selection of all cells in a range or in the entire worksheet that contain any of the following:

- **Notes** Useful for quickly finding worksheet notes that might give you more information about the worksheet.
- **Constants** Useful for finding errors in values or worksheet logic.
- **Formulas** Useful for finding formula errors.
- **Blanks** Useful for finding cells that should contain data, but don't, and are therefore causing formulas to produce misleading results.
- **Row Differences or Column Differences** Useful for finding cells in the same row or column that are different when they should be the same.
- **Precedents or Dependents** Useful for tracing how cells are connected in your worksheet, and for building macros that trace references. For more information on precedents and dependents, see "More About Auditing a Worksheet," later in this section.

For more information on finding cells with the Formula Select Special command; on finding and replacing data; or on finding specific formulas, values, or any sequence of characters, see "Finding and Replacing Cells and Data" in Chapter 4.

Selecting cells with specific contents

To do this procedure, you must be using full menus.

1. To search the entire worksheet, select a single cell.

   To limit the search to a specific range, select the range.
2. Choose Formula Select Special.
3. Select the appropriate option for what you want to find.
4. Choose OK.

Microsoft Excel makes a multiple selection of all cells in the search area with the type of contents you selected in the dialog box. For information on moving through the cells in the selection, see "Selecting Cells and Moving Around the Worksheet" in Chapter 3.

Scanning specific cells with the Info window

With the Info window displayed, you can use the Formula Select Special command to quickly scan all cell notes or cells that contain specific types of formulas or constants in a worksheet.

To do this procedure, you must be using full menus.

1. Choose Window Show Info.
2. Choose Window Arrange All to arrange the windows so you can see both the worksheet and the Info window at the same time.
3. Activate the worksheet window.
4. Choose Formula Select Special.
5. Select the option for the type of information you want to scan.
6. Choose OK.

   Microsoft Excel makes a multiple selection of all cells with notes attached or containing the type of data or formula you selected.
7. Press TAB to move cell by cell through the selected cells and display the information for each cell in the Info window.

For more information on moving through a multiple selection, see "Selecting Cells and Moving Around the Worksheet" in Chapter 3.

Checking Names

Using names helps prevent errors since you're more likely to type or select an incorrect cell reference (for example, C28 instead of D28) than to type an incorrect name (for example, Profits instead of Losses). Once you've defined a name, it's easy to get information about it.

Checking the reference of a name

1. Choose Formula Define Name.
2. In the Names In Sheet box, select the name you want to check.

   The reference of the selected name is displayed in the Refers To box.
3. Choose Close to close the dialog box.

Pasting all defined names

You can use the Formula Paste Name command to paste a list of all the names defined on a worksheet. The names and references are pasted in a column.

IMPORTANT Make sure there's sufficient room for all the names and references to be pasted without pasting over existing information on your worksheet. On a worksheet, the list of names occupies two columns, one for the names, and the other for the references. On a macro sheet, the list of names has two additional columns. The first one indicates the macro type: 1 indicates a custom function, 2 indicates a command macro, and 0 indicates neither. The other column contains the key combination used to run the macro.

1. Select the upper-left cell of the range where you want to paste the names.
2. Choose Formula Paste Name.
3. Choose the Paste List button.

Displaying names in the Info window

In the Info window you can list all the named ranges that include the active cell. With the Info window on your screen, you can arrange the windows to see both the worksheet and Info windows, and then move around the worksheet to look for specific names.

To do this procedure, you must be using full menus.

1. Choose Window Show Info.
2. Choose Window Arrange All to arrange the windows so you can see both the worksheet and the Info window at the same time.
3. With the Info window active, choose Info Names to list names in the Info window.

   Names are displayed in the Info window.
4. Activate the worksheet window.
5. Select cells to look for names.

MORE ABOUT

More About Auditing a Worksheet

Guidelines

When to use the Info Window or the Formula Select Special command The following table summarizes when to use the Info window and when to use the Formula Select Special command:

To	Use
Find precedent or dependent cells and then modify them in some way	Formula Select Special, because it actually selects the cells.
Select the precedents or dependents of all the cells in the selection, not just the active cell	Formula Select Special.
See precedents or dependents in a graphic way instead of as a list	Formula Select Special, because you can use TAB and SHIFT+TAB to move around the resulting selection and see each selected cell in context.
Quickly identify precedents or dependents as you move to different cells on the worksheet	Info window, because you can position the Info window on the screen with your worksheet window and watch the Info window as you move the active cell.
Find the precedents or dependents of cells that are far apart from each other on your document	Info window, because the list of precedents or dependents is more compact. If you use Formula Select Special, the worksheet scrolls frequently while you look at selected cells.
Print a list of the cell relationships in a model	Info window, because the information in the Info window can be printed.

Working with Direct and Indirect Precedents and Dependents You can list or select cell precedents (cells referred to by the active cell) and cell dependents (cells that refer to the active cell). Examining the precedents and dependents of a cell is useful for:

- **Finding errors** You can discover why there seems to be erroneous information on a worksheet, or the source of an error or inconsistency, or find out if cells you want to delete are needed by other formulas.
- **Faster and easier "what-if" analysis** If you want to see the effects of changing a value on the worksheet, knowing which dependent cells will be affected by the change will speed up checking the results.

MORE ABOUT

- **Understanding someone else's model (or a model you haven't used recently)** You may want to identify the initial values the worksheet is based on, and then find the cells directly dependent on those cells, and so on. This provides a quick look at the overall logic of a worksheet.

There are two ways to identify precedents and dependents:

- List them in the Info window.
- Select them with the Formula Select Special command.

When you choose the Info Precedents or Info Dependents commands from the Info window, Microsoft Excel displays a dialog box so you can specify whether you want to display all precedents or dependents, or both, of the active cell, or only direct precedents or dependents. Likewise, when you select precedents and dependents with the Formula Select Special command, you can specify all levels of precedents or dependents or just the direct precedents or dependents.

Use the following guidelines when determining the type of precedents or dependents you want displayed in the Info window or selected with the Formula Select Special command:

- **Direct precedent** A cell that is directly referred to by the formula of the active cell. For example, if the formula for the active cell is =A2+A3, then A2 and A3 are the direct precedents of the active cell.
- **Indirect precedent** A cell that is indirectly referred to by the formula of the active cell. For example, if the formula for the active cell is =A2+A4, and the formula for A2 is =A3, then A3 is an indirect precedent of the active cell (and a direct precedent of A2).
- **Direct dependent** A cell whose formula directly refers to the active cell. For example, if A1 is the active cell and the formula for A2 is =A1+A4, then A2 is a direct dependent of A1 and A4.
- **Indirect dependent** A cell whose formula indirectly refers to the active cell. For example, if A1 is the active cell and the formula for A2 is =A1+A4, and the formula for A3 is =A2, then A3 is an indirect dependent of A1 and A4 (and a direct dependent of A2).

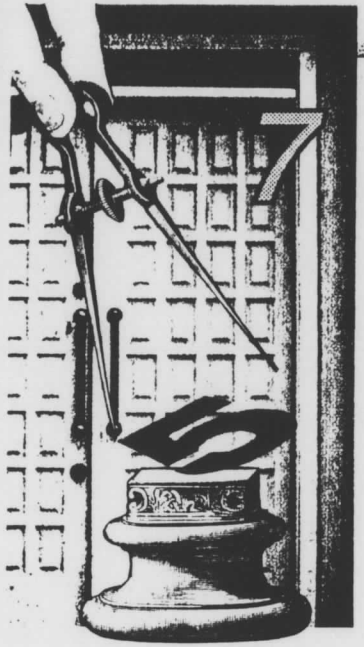
Tips

Naming Precedent and Dependent Cells You can use the Formula Select Special command to select the precedent or dependent cells, and then use the Formula Define Name command to assign a name to the selection. The Formula Define Name dialog box shows you the reference of the selection in a compact form, just as in the Info window. Once the area is named, you can easily select it with the Formula Goto command or use it in calculations.

MORE ABOUT

Attaching Cell Notes If other users will be working with your model, you can attach notes to cells explaining the worksheet model. Or you can attach notes to key cells in a macro sheet, giving instructions for running the macro. Then you can set up a guided tour of the worksheet that includes viewing the cell notes by first selecting them with the Formula Select Special command and then displaying the notes in the Info window. For information on cell notes, see "Adding Comments to a Worksheet," earlier in this chapter.

Finding Specific Characters in a Formula or Note You can use the Formula Find command and the Info window together to quickly find specific characters or text in a formula or note. Make sure both the the Info and worksheet windows are visible, activate the worksheet window, and choose the Formula Find command. Type the characters you want to find in the Find What box, and, depending on where you want Microsoft Excel to look, select the Formulas, Notes, or Values options and choose OK. Formula Find locates the cell containing the characters, and the Info window displays the information. Choose the Edit Repeat Find command to find the next cell that contains the characters.



7 Analyzing and Calculating a Worksheet

Microsoft Excel includes commands and features that help you analyze complex data on a worksheet in an automated way, and to control calculations performed on your worksheets. You can enter progressions of numbers automatically, project figures for "what-if" analysis, create a lookup table, produce multiple results with a single formula to simplify your worksheets, calculate unknown variables and formulas with circular references, and control when worksheets are calculated so you can save calculation time.

NOTE Unless otherwise noted, all information and procedures for working with worksheets also apply to macro sheets.

Table of Contents

Creating a Series of Dates or Numbers ... 253
Projecting Figures Using a Data Table ... 256
Creating a Lookup Table ... 267
Creating and Using an Array Formula ... 268
Seeking a Value That Solves a Formula ... 282
Using Iteration to Solve a Circular Reference Formula ... 283
Controlling Calculation ... 285

Creating a Series of Dates or Numbers

If you are entering dates or numbers in consecutive cells and each date or number always increases or decreases by a constant amount or factor, you can use the Data Series command to enter the dates or numbers automatically. The Data Series command is especially useful for creating a series of column or row titles based on incremental time periods, such as a weekly or monthly increment, and for creating data tables.

For information on	See
Entering dates or numeric constants	"Entering Worksheet Data" in Chapter 3
Projecting figures	"Projecting Figures Using a Data Table" later in this chapter

Online Help also provides information on creating a series of dates or numbers. To display online Help, choose the Window Help command. If you are using system software version 7.0 and the Help command does not appear on the Window menu, display Help by pointing to the Help menu icon and choosing the Microsoft Excel Help command. For information on a specific command, select the Commands topic. For information on using online Help, see "Using Help" in Chapter 1.

Types of Series

You can create three types of series in Microsoft Excel:

- **Date series** When you use a date series, you can specify that Microsoft Excel build the series based on increments of days, weekdays, months, or years. For example, if you start a series with the date Jan-91 and specify increments of months, Microsoft Excel creates the series Jan-91, Feb-91, Mar-91, and so on, and enters each new date in the next cell in the selection.
- **Linear series** When you use a linear series, Microsoft Excel increases or decreases values by a constant increment or decrement. For example, if you start a linear series with 1 and specify a step value (constant increment) of 2, Microsoft Excel creates the series 1, 3, 5, 7, 9, and so on. To create a series that decreases, you use a negative number as the step value.
- **Growth series** When you use a growth series, Microsoft Excel multiplies values by a constant factor. For example, if you start a growth series with 1 and specify a step value (factor) of 2, Microsoft Excel creates the series 1, 2, 4, 8, 16, 32, and so on.

One use of the Data Series command is to fill in compounded interest or growth rates. In this case, you use the growth series type. For example, if you want to see how $1,000 grows each month in a money market account that earns 10 percent annual interest, you would enter $1000 as the starting value, select that cell and 12 other cells to fill, and use an increment of 100.83% (100% plus the result of 10% divided by 12). The Data Series command fills the cells with values that show the compounded interest added to the capital after each month, as shown in the following illustration:

	A	B
1	Initial deposit	$1,000.00
2	Month 1	$1,008.30
3	Month 2	$1,016.67
4	Month 3	$1,025.11
5	Month 4	$1,033.62
6	Month 5	$1,042.19
7	Month 6	$1,050.84
8	Month 7	$1,059.57
9	Month 8	$1,068.36
10	Month 9	$1,077.23
11	Month 10	$1,086.17
12	Month 11	$1,095.18
13	Month 12	$1,104.27
14		
15		

Growth series

NOTE Data plotted in a chart is referred to as a data series. Chart data series are not related to the series created using the Data Series command. For more information on chart data series, see "Creating a New Chart" in Chapter 11.

Entering a series in a single row or column

When you enter a series of dates or numbers, you specify the starting value; the direction you want to fill (row or column); the increment, decrement, or factor; and, optionally, a stop value for the series. Microsoft Excel then creates and enters the series based on your specifications. If you don't specify a stop value, Microsoft Excel fills the entire selection.

To do this procedure, you must be using full menus.

1. In the first cell you want filled with the series, enter the starting value for the series.
2. Select the cells in the row or column that you want to fill with the series, including the starting value as the first cell in the selection.
3. Choose Data Series.
4. If your selection is a row, select the Rows option under Series In.

   If your selection is a column, select the Columns option under Series In.
5. Under Type, select a series type.

   If you select the Date option, also specify the date unit you want to use.
6. In the Step Value box, type the increment, decrement, or factor you want to use.
7. If you want Microsoft Excel to stop filling the selection when it reaches a certain value, type that value in the Stop Value box. Otherwise, Microsoft Excel fills the entire selection.

   If you enter a stop value, but the selection is too small to fit the entire series, Microsoft Excel stops entering the series when it reaches the end of the selected range.
8. Choose OK.

Entering a series in multiple rows or columns

You can also create several series at once by entering a start value for each row or column you want to fill and selecting a cell range that includes the start values as the first cell selected in each row or column. The selection can be a multiple selection. Make sure that the first row or column of each selection in a multiple selection contains the starting values for that selection.

To do this procedure, you must be using full menus.

1. Enter the starting values in a row or column.
2. Select the starting values and the adjacent cells you want to fill with the series. Make sure that the starting values are in the first row or column of the selection.
3. Choose Data Series.

4 If you want the series entered from left to right in a row, select the Rows option under Series In.

If you want the series entered from top to bottom in a column, select the Columns option under Series In.

5 Under Type, select a series type.

If you select the Date option, also specify the date unit you want to use.

6 In the Step Value box, type the increment, decrement, or factor you want to use.

7 If you want Microsoft Excel to stop filling the selection when it reaches a certain value, type that value in the Stop Value box. Otherwise, Microsoft Excel fills the entire selection.

If you enter a stop value, but the selection is too small to fit the entire series, Microsoft Excel stops entering the series when it reaches the end of the selected range.

8 Choose OK.

Projecting Figures Using a Data Table

Once you have entered formulas on your worksheet, you may want to perform a "what-if" analysis to see how changing certain values in your formulas affects the results of the formulas. It can be very time-consuming to manually change values one by one. Data tables provide a shortcut. You set up the table and then let Microsoft Excel calculate all the variations in one operation.

A *data table* is a range of cells that shows the results of substituting different values in one or more formulas. There are two types of data tables: a one-input table and a two-input table. With a one-input table you enter different values for one variable and see the effect on one or more formulas. With a two-input table you enter different values for two variables and see the effect on one formula.

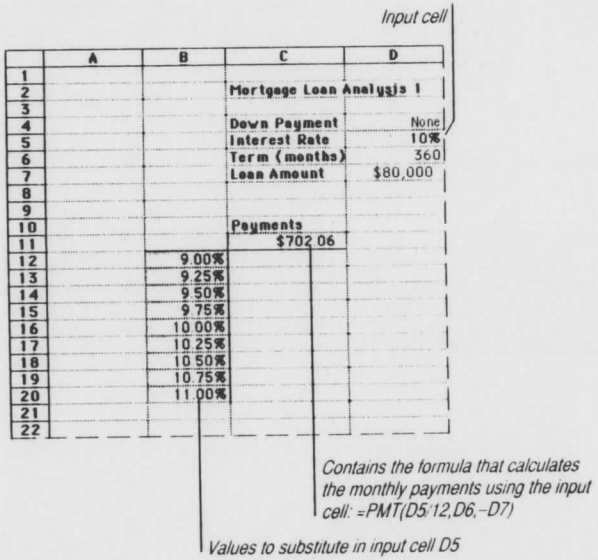
NOTE You cannot create a data table on a macro sheet.

For information on	See
Entering data as a database	Chapter 9, "Creating and Using a Database on a Worksheet"
Solving for a variable	"Seeking a Value That Solves a Formula" later in this chapter
Extracting values from a lookup table	"Creating a Lookup Table" later in this chapter and the LOOKUP functions in the *Microsoft Excel Function Reference*

Online Help also provides information on projecting figures using a data table. To display online Help, choose the Window Help command. If you are using system software version 7.0 and the Help command does not appear on the Window menu, display Help by pointing to the Help menu icon and choosing the Microsoft Excel Help command. For information on a specific command, select the Commands topic. For information on using online Help, see "Using Help" in Chapter 1.

Using a One-Input Data Table

If you want to see how changes in one number affect one or more formulas, use a one-input data table. For example, suppose you are considering getting an $80,000 mortgage, and want to see how your monthly payment would change depending on the interest rate of the loan. The following table is set up so that the interest rates entered in column B will be substituted in cell D5—the *input cell*—and the resulting monthly payments will be entered in the cells below the formula in cell C11:



The input cell, D5, is referenced in the payment formula in cell C11 and is the cell that Microsoft Excel varies to calculate the data table.

You can use as many formulas and substitute values as you want. In this example, you could enter additional formulas to the right of cell C11 that would calculate other figures that vary depending on the interest rate, such as the total interest paid on the loan. Each formula must refer to the input cell (the cell that values are substituted into), either directly or by referring to other cells that refer to the input cell.

You can also switch the values and formulas, entering the formulas down the side of the table in a column and the values in a row across the top of the table.

Setting up a one-input table

1 In a column or row, enter the values that you want to substitute into the input cell.

2 If the values are in a column, as in the previous example, enter the formula that refers to the input cell in the row above the first value and one cell to the right of the column of values. Enter any additional formulas to the right of the first formula in the same row.

   If the values are in a row, enter the formula that will use the input cell in the column to the left of the first value and one cell below the row of values. Enter additional formulas below the first formula in the same column.

The input cell can be empty. That won't affect the values calculated in the table, but the cells containing the formulas will show the results of calculating the formulas with an input value of zero. When the input cell is blank, Microsoft Excel uses zero as its value.

NOTE If the values to be substituted are spaced evenly (such as 1000, 2000, 3000, or 1.5%, 1.75%, 2%), you can save time by entering them with the Data Series command. For more information, see the preceding section, "Creating a Series of Dates or Numbers."

Filling in a one-input table

To do this procedure, you must be using full menus.

1 Select the rectangular range containing the formula or formulas and the values to substitute.

   In the preceding example, you would select B11:C20.

2 Choose Data Table.

3 If the values to be substituted are in a row, enter the reference to the input cell in the Row Input Cell box. If the values to be substituted are in a column, enter the reference to the input cell in the Column Input Cell box.

   You can enter the cell reference by typing the reference or selecting the cell. If the dialog box hides an input cell you want to select, move the dialog box by dragging its title bar with the mouse.

   In the preceding example, the values to be substituted are in a column, so you would enter the reference to the input cell—cell D5—in the Column Input Cell box.

4 Choose OK.

   Microsoft Excel substitutes each value into the input cell and fills in the table with the results of the formulas.

After you carry out the Data Table command, the table from the previous example looks like this:

	A	B	C	D
1				
2			Mortgage Loan Analysis 1	
3				
4			Down Payment	None
5			Interest Rate	10%
6			Term (months)	360
7			Loan Amount	$80,000
8				
9				
10			Payments	
11			$702.06	
12		9.00%	$643.70	
13		9.25%	$658.14	
14		9.50%	$672.68	
15		9.75%	$687.32	
16		10.00%	$702.06	
17		10.25%	$716.88	
18		10.50%	$731.79	
19		10.75%	$746.79	
20		11.00%	$761.86	
21				
22				

Values calculated by the Data Table command

Adding formulas to an existing table

The preceding example shows how to use a one-input table to see the effect of changing interest rates on a single formula. To see the effect of changing interest rates on more than one formula, you can add one or more formulas to the existing one-input table. You could, for example, add a formula that totals the interest paid over the life of the loan, depending on the interest rate of the loan, as shown in the illustration following this procedure.

To do this procedure, you must be using full menus.

1 Enter the new formulas in the row or column containing the existing formulas. The new formulas should be adjacent to the existing formulas.

   In the example, you would enter the formula that totals the interest paid on the loan in the cell to the right of the monthly payments formula.

2 Select the rectangular range containing the formulas and the values.

   In the example, you would select B11:D20.

3 Choose Data Table.

4 In the dialog box, enter the reference to the input cell.

   In the example, you would enter a reference to cell D5 in the Column Input Cell box.

5 Choose OK.

The result of adding the total interest formula to the data table and calculating it with the Data Table command is shown in the following illustration:

	A	B	C	D
1				
2			Mortgage Loan Analysis 1	
3				
4			Down Payment	None
5			Interest Rate	10%
6			Term (months)	360
7			Loan Amount	$80,000
8				
9				
10			Payments	Total Interest
11			$702.06	$172,740.61
12		9.00%	$643.70	$151,731.31
13		9.25%	$658.14	$156,930.52
14		9.50%	$672.68	$162,166.01
15		9.75%	$687.32	$167,436.47
16		10.00%	$702.06	$172,740.61
17		10.25%	$716.88	$178,077.17
18		10.50%	$731.79	$183,444.92
19		10.75%	$746.79	$188,842.63
20		11.00%	$761.86	$194,269.14
21				
22				

*This cell contains the formula for the total interest paid: =(C11*D6)–D7. It refers to cell C11 which refers to the input cell D5.*

Using a Two-Input Table

If you want to see how changes in two numbers affect one formula, use a two-input table. For example, suppose you are considering getting an $80,000 mortgage and want to see how your monthly payment would change depending on both the interest rate and term of the loan.

Setting up a two-input table

1 In a cell, enter the formula that will use the substituted values.

   The formula should refer to two input cells, either directly or by referring to other cells that refer to the input cells. The input cells are the cells into which values will be substituted.

2 Starting in the cell below the formula, enter the values that you want substituted into one input cell. Enter these values in the same column as the formula.

3 Starting in the cell to the right of the formula, enter the values that you want substituted into the other input cell. Enter these values in the same row as the formula.

In the example in the following illustration, the worksheet is set up so that interest rates entered in column A will be substituted into one input cell—D5—and loan terms entered in row 9 will be substituted into a second input cell—D6:

=ABS(PMT(D5/12,D6,D7))

Column input cell

Row input cell

	A	B	C	D	E	F
1						
2		Mortgage Loan Analysis 2				
3						
4		Down Payment		None		
5		Interest Rate		10%		
6		Term (months)		360		
7		Loan Amount		$80,000		
8						
9	$702.06	180	240	300	360	400
10	9.00%					
11	9.25%					
12	9.50%					
13	9.75%					
14	10.00%					
15	10.25%					
16	10.50%					
17	10.75%					
18	11.00%					
19						
20						

These values will be substituted in cell D5.

These values will be substituted in cell D6.

Filling in a two-input table

To do this procedure, you must be using full menus.

1 Select the range of cells containing the row and column of values and the formula.

For the preceding example, you would select A9:F18.

2 Choose Data Table.

3 In the Row Input Cell box, enter the reference to the input cell in which you want the row of values to be substituted.

You can enter the reference by typing or by selecting the cell. For the preceding example, you would enter a reference to cell D6.

4 In the Column Input Cell box, enter the reference to the input cell in which you want the column of values to be substituted.

For the preceding example, you would enter a reference to cell D5.

5 Choose OK.

After carrying out the Data Table command, the example table looks like this:

	A	B	C	D	E	F
1						
2		Mortgage Loan Analysis 2				
3						
4		Down Payment		None		
5		Interest Rate		10%		
6		Term (months)		360		
7		Loan Amount		$80,000		
8						
9	$702.06	180	240	300	360	400
10	9.00%	$811.41	$719.78	$671.36	$643.70	$631.81
11	9.25%	$823.35	$732.69	$685.11	$658.14	$646.64
12	9.50%	$835.38	$745.70	$698.96	$672.68	$661.56
13	9.75%	$847.49	$758.81	$712.91	$687.32	$676.58
14	10.00%	$859.68	$772.02	$726.96	$702.06	$691.69
15	10.25%	$871.96	$785.31	$741.11	$716.88	$706.87
16	10.50%	$884.32	$798.70	$755.35	$731.79	$722.14
17	10.75%	$896.76	$812.18	$769.67	$746.79	$737.49
18	11.00%	$909.28	$825.75	$784.09	$761.86	$752.90
19						
20						

Values calculated by the Data Table command

Editing a Table

You can edit the input values or formulas in the top row or left column of a table. If the Automatic option is selected in the Options Calculation dialog box, Microsoft Excel immediately calculates the table after you edit any cells that affect the table results.

Because the resulting values in a data table are an array, you cannot edit them individually. If you try to edit the data table values, Microsoft Excel displays a message telling you that you cannot change part of a table. You can, however, copy the values. When you do, only the values are copied, not the table formulas for those values. For information on the table formulas for the resulting values of a data table, see "More About Projecting Figures Using a Data Table," later in this section.

Selecting an entire table

If you want to recalculate the table by choosing the Data Table command again, or if you want to move or delete a table, you must first select the entire table. Microsoft Excel treats a data table as an array range, so you can select it quickly with the Formula Select Special command or a keyboard shortcut. The following procedure selects the entire table, including the formulas and input values.

To do this procedure, you must be using full menus.

1 Select any result cell inside the table.

2 Choose Formula Select Special.

3 Select the Current Array option.

4 Choose OK.

You can also select the array range by pressing COMMAND+SHIFT and double-clicking any cell in the array range, or by selecting any cell in the array range and pressing CTRL+SLASH (/).

Adding input values to a table

To do this procedure, you must be using full menus.

1 Enter the new values in the blank cells adjacent to the original values (either at the bottom of the left column or at the end of the top row).

2 Select the entire table, including the new values.

3 Choose Data Table.

4 For a one-input table, enter the reference for the input cell.

For a two-input table, enter the references for both the row and column input cells.

5 Choose OK.

Microsoft Excel calculates the table with the additional values.

Clearing the resulting values in a table

If you made an error in a table, such as entering the wrong reference to an input cell, you can clear just the resulting values. However, you must clear all of the values.

1. Select all the resulting values in the table.

   Make sure not to select the formulas and input values. If you select these also, Microsoft Excel clears the entire table, including the formulas and input values.

2. Choose Edit Clear.
3. Choose OK.

Clearing the entire table

1. Select the entire table, including the input values, the formulas, and the resulting values inside the table.
2. Choose Edit Clear.
3. Choose OK.

Moving a table

1. Select the entire table, including the input values, the formulas, and the resulting values inside the table.
2. Choose Edit Cut.
3. Select the paste area.
4. Choose Edit Paste.

Converting the resulting data table values to constant values

Because of the restrictions that apply to editing a data table, you may want to convert the data table results into a range of constant values, so you can edit the data table—deleting or inserting cells in the table, for example.

To do this procedure, you must be using full menus.

1. Select all the resulting values in the table.
2. Choose Edit Copy.
3. Choose Edit Paste Special.
4. Under Paste, select the Values option.
5. Choose OK.

MORE ABOUT

More About Projecting Figures Using a Data Table

Guideline

Data Table Formulas The Data Table command copies the same table formula into every cell in a table. Microsoft Excel encloses the formula in braces, just as it does an array formula, to indicate that the cell is part of a table and that you cannot edit the formula.

Here are some examples of table formulas:

Type of table	Formula	Description
One-input table with a row input cell	{=TABLE(D9,)}	D9 is the input cell. Since the reference is followed by a comma, the cell is a row input cell.
One-input table with a column input cell	{=TABLE(,E8)}	E8 is the column input cell. Since the reference is preceded by a comma, the cell is a column input cell.
Two-input table	{=TABLE(D9,E8)}	D9 is the row input cell; E8 is the column input cell.

Tips

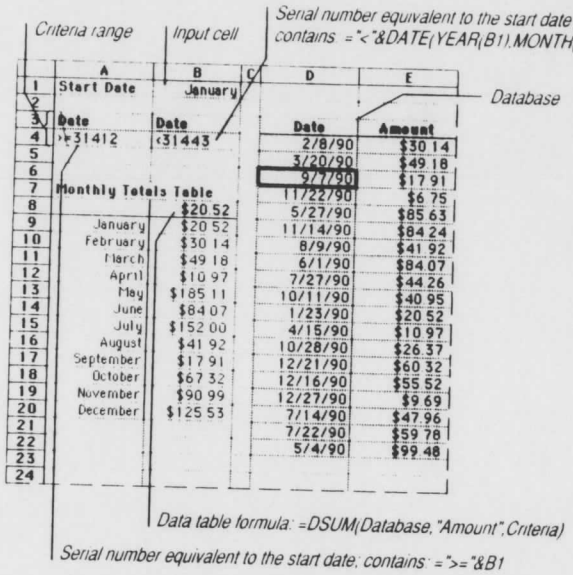
Speeding Up Calculation of a Worksheet Containing a Data Table Microsoft Excel calculates all the formulas that depend on the input cell every time it tests a new input value in the cell, or every time you edit one of the formulas used to generate the data table results. Therefore, tables usually require more time to be calculated than normal worksheet formulas.

You can control when tables are calculated by choosing Options Calculation and selecting the Automatic Except Tables option. Then, whenever you want Microsoft Excel to calculate the table, choose Options Calculate Now. For more information on controlling calculation, see "Controlling Calculation," later in this chapter.

Summarizing a Database You can use a data table to create a summary of totals for a database on a worksheet. Microsoft Excel includes functions that operate on a database and restrict their operation to the records that meet the criteria you enter on the worksheet. To use the same database function repeatedly on a database, but with different criteria each time, use a data table. The data table input values are substituted into the criteria range and the results of performing the database function with different criteria are displayed in the table.

MORE ABOUT

For example, the following illustration shows monthly totals for the database in D3:E22:



The data table formula in cell B8 refers to the criteria range, which refers to the input cell. As the input cell varies, so does the set of database records that is summed.

The table formula in cell B8 uses the database function DSUM to calculate the "Amount" field totals. In the criteria range, the first formula refers to the input cell to determine the starting date. The second formula uses the worksheet functions DATE, YEAR, MONTH, and DAY to generate the serial number for the starting date plus one month. For information on these functions, see the *Microsoft Excel Function Reference*. For information on working with a database, see Chapter 9, "Creating and Using a Database on a Worksheet" and Chapter 10, "Analyzing and Reporting Database Information."

Creating a Lookup Table

You can use a *lookup table* to find one piece of information that is based on another piece of information. For example, you can use a lookup table to determine the discounts to give to customers based on the type of account they have and the amount of their invoice.

A lookup table consists of a column or row of ascending values, called the *compare values*, and corresponding data for each compare value, as shown in the following illustration:

	A	B	C
1		Major Account	Other Account
2	Invoice	Discount	Discount
3	0	5%	0%
4	500	7.50%	2.50%
5	1000	15%	5%
6	5000	25%	10%
7	50000	40%	20%
8			
9			

Compare values *Data*

In the illustration, the first column contains the compare values and the rest of the table contains the data. You could also set up the lookup table with the compare values in the first row of the table and the data in the rows below.

You must list compare values in ascending order. The lowest value must be at the top of the column or the left of the row, and compare values should ascend as you move down the column or across the row. The order of values, from lowest to highest, is:

- Negative numbers (... –11, –10, –9...)
- Zero (0)
- Positive numbers (... 9, 10, 11...)
- Text values, in alphabetical order (A–Z)
- Logical values (FALSE then TRUE)

You get data from the lookup table by using the lookup functions HLOOKUP, VLOOKUP, or LOOKUP. When you use a lookup function, Microsoft Excel scans the lookup table for the compare value you specify, and then returns the appropriate piece of information you want. Which function you use depends on how you set up your lookup table.

If	Use
Your compare values are in the first row of the lookup table	HLOOKUP
Your compare values are in the first column of the lookup table	VLOOKUP
Your compare values aren't adjacent to your data	LOOKUP

In the previous example, you would use the VLOOKUP worksheet function because the compare values are in a column. To use this lookup function, you must specify three arguments: *lookup_value*, *table_array*, and *col_index*. *Lookup_value* is the value to look up in the compare values, and *table_array* is the reference of the lookup table. *Col_index* is an index number that tells where to look in the data for the value to return; in VLOOKUP, this index number tells what column to look in and, in HLOOKUP, the index number tells what row to look in.

For the previous example, the function VLOOKUP(1200,A3:C7,3) would look in the first column of the table to find the largest value less than or equal to 1200, and then look in the third column of the lookup table to find 5%.

For more information on the three lookup functions, see the *Microsoft Excel Function Reference*.

Online Help also provides information on Microsoft Excel functions. You can quickly display online Help by choosing the Window Help command. If you are using Macintosh system software version 7.0 and a high-resolution monitor, you can display Help by choosing the Help Microsoft Excel Help command. If you need reference information on a specific Microsoft Excel function, select the Worksheet Functions topic. For information on using online Help, see "Using Help" in Chapter 1.

Creating and Using an Array Formula

With an *array formula*, you can enter a single formula that performs an operation on multiple inputs and produces multiple results, with each result displayed in a separate cell.

Although you can create almost all worksheet models using ordinary values and formulas, you may find that you can simplify your worksheet and reduce the amount of time you spend entering formulas by using array formulas. Array formulas also reduce the amount of memory used by your worksheet. Array formulas are particularly useful for performing the same operation or set of operations on adjacent ranges of cells.

In an array formula, you can also enter a list of constant values—called an *array constant*—as an operand for a normal operation such as addition or multiplication, or as an argument to a function. Using array constants in a formula is useful for producing multiple results or combining several sets of inputs into one operation. Some worksheet functions, such as LINEST, require array constants or references to cell ranges as arguments, and return array constants.

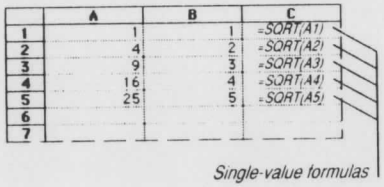
For information on	See
Entering formulas	"Entering a Formula" in Chapter 3
Using worksheet functions	"Using Worksheet Functions to Simplify Formulas" in Chapter 3
Array constants	"Using Array Constants Instead of Cell Ranges" later in this section

Understanding Array Formulas

To understand how an array formula works, first consider how an ordinary, single-value formula works. A single-value formula produces a single result from one or more arguments or operands. For example, the formula =A1+B1 produces a single result—the sum of the values in cells A1 and B1.

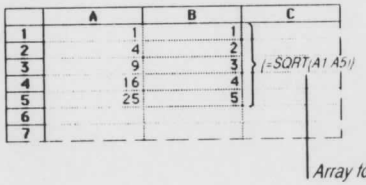
Array formulas differ from single-value formulas in that they can produce more than one result from a group of arguments or operands. For example, the array formula {=A1:A3+B1:B3} produces a set of three results—the sum of the values in cells A1 and B1, the sum of the values in cells A2 and B2, and the sum of the values in cells A3 and B3. Each result is displayed in a separate cell.

Because array formulas can produce multiple results, you can use array formulas to reduce the amount of time you spend entering repetitive formulas. A single array formula can take the place of several single-value formulas. For example, suppose you want to calculate the square root of each number entered in cell range A1:A5. You could enter five single-value formulas in five cells:



Single-value formulas

Or, you could enter one array formula in five cells:



Array formula

You can recognize an array formula by the braces ({}) enclosing it. Microsoft Excel automatically puts the braces around a formula when you enter it as an array; you don't type the braces yourself.

Unlike a single-value formula, which can occupy only a single cell, an array formula can occupy a rectangular area of cells. Using just one array formula instead of several single-value formulas also saves memory.

You may also find that you can simplify some worksheet models by using array formulas. For some calculations, you can replace several different formulas with a single array formula that consolidates all of the calculations into one result.

For example, suppose you want to create a worksheet model to compute the total value of your holdings in a number of different stocks. You might have shares of three different stocks, each trading at a different price. The value of each stock is the product of the price and the number of shares. The total value of your holdings is the sum of the value of each stock. To compute the total value of your holdings, you could create the following worksheet model using single-value formulas:

*The stock values are produced by three separate formulas: =B2*B3, =C2*C3, =D2*D3*

	A	B	C	D
1		Acme	Apex	Apogee
2	Shares	500	300	150
3	Price	$10	$15	$50
4	Value	$5,000	$4,500	$7,500
5				
6	Total	$17,000		
7				
8				

The formula =SUM(B4:D4) computes the sum of the three stock values in B4:D4.

First you compute the value of each stock by entering three formulas, =B2*B3, =C2*C3, and =D2*D3 in cells B4, C4, and D4, respectively. These formulas produce three single values. Then, in another cell, you sum the three single values by entering the formula =SUM(B4:D4) to produce the total value of $17,000.

In this model, you had to enter four formulas in all. Instead, you can compute the total value of your holdings with one array formula: {=SUM(B2:D2*B3:D3)}. This formula multiplies the number of shares of each stock (in cells B2:D2) by its corresponding price (in cells B3:D3), and then sums the three resulting products as shown in the following illustration:

	A	B	C	D
1		Acme	Apex	Apogee
2	Shares	500	300	150
3	Price	$10	$15	$50
4				
5	Total	$17,000		
6				
7				

*The array formula {=SUM(B2:D2*B3:D3)} computes the array of stock values, and then sums the values in the array.*

Entering an Array Formula in a Range of Cells

Most results that you want to compute on a worksheet can be described by single values. However, some results can be described only by the multiple values of an array formula entered in a range of cells—called an *array range*.

For example, suppose you want to compute the trend of your monthly sales over the last six months. That trend is described not by one value, but by six—the trend values corresponding to the sales in each of the last six months. Microsoft Excel provides a worksheet function, TREND, that performs this computation for you and produces the six values. For information on the TREND function, see the *Microsoft Excel Function Reference*.

Because each cell on a worksheet can contain only one value, you enter the trend formula in more than one cell at once, as shown in the following illustration:

	A	B	C	D	E	F	G
1		Jan	Feb	Mar	Apr	May	Jun
2	Actual sales	$3,100	$4,500	$4,400	$5,400	$7,500	$8,100
3	Trend of sales	$3,000	$4,000	$5,000	$6,000	$7,000	$8,000
4							
5							

The array formula {=TREND(B2:G2)} is entered in the array range B3:G3.

When you enter an array formula, the formula should produce an array with the same dimensions as the array range into which it was entered. Then, Microsoft Excel can display each value in the resulting array in one cell of the array range. If the resulting array is smaller than the range in which you enter the formula, Microsoft Excel expands the resulting array to fill the array range. If the resulting array is larger than the array range, not all of the results produced are displayed. For more information on how Microsoft Excel expands arrays, see "More About Creating and Using an Array Formula," later in this section.

If you select any cell in the range containing the array formula, the same array formula is displayed in the formula bar. You cannot change or delete individual cells in the array range because all the cells share a single formula.

Entering an array formula

When you enter a formula as an array formula, you are telling Microsoft Excel that the formula produces an array as the result of an operation or contains an array constant as an argument.

1. Select the cell or range of cells in which you want to enter the formula.

   The selection should have the same dimensions as the resulting array produced by the formula.

2. Build the formula using the normal formula entry techniques.

   Make sure that each argument or operand includes the entire cell range or set of values you want used for the operation or function. Do not type the braces around the formula; Microsoft Excel adds the braces when you enter the formula as an array formula. If you type the braces, Microsoft Excel interprets the entry as text.

3. Press COMMAND+ENTER.

For information on formula entry techniques, see "Entering a Formula" in Chapter 3.

Editing an Array Range

Because an array range shares one formula, you edit an array range differently than ordinary cells. When you edit an array range, you edit the entire range at once as if it were a single cell. You cannot perform any operation that changes only a portion of the array range. For example, you cannot:

- Change the contents of cells that form only part of an array.
- Clear or move cells that form only part of an array.
- Delete cells that form only part of an array.
- Insert cells into an array range.

If you attempt any of these operations, Microsoft Excel displays a message that tells you the operation cannot be done for an array.

Although you cannot change or delete portions of an array range, you can format cells in an array range independently. You can also copy and paste a cell or range of cells from an array range to another part of the worksheet. Microsoft Excel adjusts the relative references in the copied formula just as it does with ordinary formulas.

Editing an array formula

1. Select any cell in the array range.
2. Activate the formula bar.

   The array formula braces disappear when the formula bar is active.

3. Edit the formula.
4. Press COMMAND+ENTER.

Selecting an array range

To perform some editing operations, you will need to select the entire array range. You can select it quickly with the Formula Select Special command or a keyboard or mouse shortcut.

To do this procedure, you must be using full menus.

1. Select any cell in the array range.
2. Choose Formula Select Special.
3. Select the Current Array option.
4. Choose OK.

You can also select the array range by pressing COMMAND+SHIFT and double-clicking any cell in the array range, or by selecting any cell in the array range and pressing CTRL+SLASH (/).

Converting an array range to constant values

Because of the restrictions that apply to editing an array range, you may want to convert the array formula results into a range of constant values, so you can edit the cells in the array range. For example, you can insert or delete cells in the array range once the range has been converted to constant values.

To do this procedure, you must be using full menus.

1. Select the array range.
2. Choose Edit Copy.
3. Choose Edit Paste Special.
4. Under Paste, select the Values option.
5. Choose OK.

Clearing an array range

1 Select the array range.

2 Choose Edit Clear.

3 Choose OK.

Using Array Constants Instead of Cell Ranges

In an ordinary formula, you can either enter a reference to a cell containing a value, or type the value itself into the formula. Similarly, in any array formula where you use a reference to a range of cells, you can instead type the array of values contained in the range of cells. The array of values you type is called an *array constant*. Generally, you use array constants in place of references when you don't want to enter each constant value in a separate cell on your worksheet.

To enter an array constant in an array formula, type the set of values directly into the formula and enclose them in braces ({}). Separate values in the same row with commas. Separate the rows of the array with semicolons.

When entering an array constant, you must type the braces around the array constant; Microsoft Excel does not automatically add the braces for you. If a formula contains an array constant and produces an array as a result, you must enter it as an array formula by pressing COMMAND+ENTER. Otherwise, the formula operates on only the first value in the array constant.

For example, to use the following array in a formula:

1 2 3
4 5 6

you would type: **{1,2,3;4,5,6}**

The array constant {1,2,3;4,5,6} is a 2-by-3 array because it consists of 2 rows of 3 values each, or 2 rows and 3 columns. You can use an array constant in place of a cell range reference in any formula that uses multiple operands or arguments.

For example, suppose you sell one type of lumber in four different lengths. The longer the lumber, the lower the price per foot. You could enter the lumber lengths and their corresponding per-foot prices in worksheet cells and use an array formula to calculate the price of the different lengths, as shown in the following illustration:

	A	B	C
1	Length in feet	Price/foot	Price/unit
2	3	$4.00	$12.00
3	6	$3.75	$22.50
4	9	$3.25	$29.25
5	12	$2.50	$30.00
6			
7			

*{=A2:A5*B2:B5}*

Or, you could replace the reference to cells B2:B5 in the array formula with the array constant {4;3.75;3.25;2.5} and delete column B, reducing the size of your worksheet and increasing the number of cells available for other data:

	A	B
1	Length in feet	Price/unit
2	3	$12.00
3	6	$22.50
4	9	$29.25
5	12	$30.00
6		
7		

{=A2:A5{4,3.75,3.25,2.5}}*

Array constants can contain numbers, text, logical values, or error values. These values must be entered in formats accepted in a formula. Numbers can be in integer, decimal, or scientific format, but cannot contain dollar signs, parentheses, or percent signs. Text must be enclosed in double quotation marks. You can also include different types of values in the same array constant.

Here are some examples of array constants:

Type	To get this				
{10,20,30,40}	1-by-4 array:	10	20	30	40
{100;200;300}	3-by-1 array:	100 200 300			
{7,8,9;"x","y","z"}	2-by-3 array:	7 x	8 y	9 z	

The values in an array constant must be constants and not formulas. For example, you could not use {1+2,3+4} as an array constant. Also, you cannot enter array constants that have columns or rows of unequal length. For example, {1,2,3;4,5} is not a valid array constant since the first row contains three values and the second row contains only two values.

Microsoft Excel does not allow you to list cell references or names in an array formula the same way that you list constants. For example, you could not use {A1,B1,C1} to represent the array containing the values in cells A1, B1, and C1. Instead, you must use the cell range reference A1:C1 or enter the values of those cells directly in the array as constants—for example, {10,20,30}.

Array constants are also very useful in worksheet functions. In an example earlier in this section, the TREND function was used to compute the sales trend for January through June. You can add an array constant as an argument to this same function to calculate the projected trend for the next three months of sales. In the formula {=TREND(B2:G2,,{7,8,9})}, the array constant {7,8,9} tells Microsoft Excel to calculate the seventh, eighth, and ninth values for the trend:

	A	B	C	D	E	F	G	H	I	J
1		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
2	Actual sales	$3,100	$4,500	$4,400	$5,400	$7,500	$8,100			
3	Trend of sales	$3,000	$4,000	$5,000	$6,000	$7,000	$8,000	$9,000	$10,000	$11,000
4										
5										

{=TREND(B2:G2,,{7,8,9})}

Note that the two consecutive commas before the array constant {7,8,9} denote a missing optional argument in the function, not columns in the array.

Using Array Functions

Microsoft Excel includes some worksheet and macro sheet functions that return arrays of values or require either array constants or references to cell ranges as arguments. These functions are:

Function name	Array usage
APPLY.NAMES (macro-only function)	Can accept an array as an argument
COLUMN	Returns an array when the argument is a range
COLUMNS	Requires an array or cell range as an argument
CONSOLIDATE (macro-only function)	Requires that the list of sources be entered as an array
DOCUMENTS (macro-only function)	Returns an array when more than one document is open
FILES (macro-only function)	Always returns an array
FORMULA.ARRAY (macro-only function)	Always returns an array
GET.DOCUMENT (macro-only function)	Returns an array when certain argument values are used
GET.WINDOW (macro-only function)	Returns an array when certain argument values are used
GROWTH	Requires arrays or cell ranges as arguments and can return an array
HLOOKUP	Requires an array or cell range as an argument
INDEX (array form)	Requires an array as an argument and can return an array
LINEST	Always returns an array

Function name	Array usage
LOGEST	Always returns an array
LOOKUP (array form)	Requires an array or cell range as an argument
MATCH	Requires an array or cell range as an argument
MDETERM	Requires an array as an argument
MINVERSE	Always returns an array
MMULT	Always returns an array
NAMES (macro-only function)	Always returns an array
ROW	Returns an array when the argument is a range
ROWS	Requires an array or cell range as an argument
SUMPRODUCT	Requires arrays, cell ranges, or values as arguments
TRANSPOSE	Always returns an array
TREND	Requires arrays or cell ranges as arguments and can return an array
VLOOKUP	Requires an array or cell range as an argument
WINDOWS (macro-only function)	Always returns an array
WORKGROUP (macro-only function)	Always returns an array

There are also other functions that can take either single-value arguments or array arguments. These functions return different results when used with array arguments. For information on the arguments accepted by each of the functions and the results they return, see the *Microsoft Excel Function Reference*.

If you enter a function that returns an array, you should enter the function as an array formula in an array range that matches the size of the array returned by the function. If you don't enter the function as an array formula in an array range, the function may return only a single value displayed in the selected cells or it may return error values, depending on the function used.

Before you enter a function on a worksheet, you need to know what the function returns. For example, the MINVERSE (matrix inverse) function, returns an array the same size as its argument. This function should be entered as an array in an array range the same size as the argument array. Another function, TRANSPOSE, returns an array with the opposite dimensions of its argument. If the argument is one row by three columns (a 1-by-3 array), then the result is a 3-by-1 array. For example, the array formula {=TRANSPOSE({1,2,3;"A","B","C"})} takes the 2-by-3 array and returns the 3-by-2 array {1,A;2,B;3,C}. Use the TRANSPOSE function on the result of an array formula if you want to enter the formula in an array range with the opposite dimensions of the resulting array.

For more information on using functions, see "Using Worksheet Functions to Simplify Formulas" in Chapter 3.

MORE ABOUT

More About Creating and Using an Array Formula

Guidelines

Relative References in Array Formulas Relative references in an array formula are always considered to be relative to the upper-left corner cell of the array range.

Using Arrays as External References You can link a range of cells on one worksheet to a range of cells on another by entering the external cell reference as an array. Entering the external reference as an array formula instead of separate references reduces the amount of memory used by your worksheet and ensures that the range cannot be accidentally disrupted by editing individual cells. For example, if the worksheet Worksheet1 contains values in cells B8:E8 that you want displayed in cells D3:G3 on a second worksheet, and you don't need to edit those cells individually, you can enter the array formula {=Worksheet1!$B$8:$E$8} in cells D3:G3 on the second worksheet. Then when you change the values in cells B8:E8 on Worksheet1, Microsoft Excel updates the range of cells D3:G3 on the second worksheet.

How Microsoft Excel Expands Array Operands, Arguments, and Results When you use an array as an operand or as an argument to a function, all other operands or arguments to that function should be the same dimension as the first array. If necessary, Microsoft Excel expands an operand or argument to the dimensions required by an operation.

For example, in the formula =SUM({1,2,3}*4), one operand to the multiplication operator is a 1-by-3 array and the other is a single value. In evaluating this formula, Microsoft Excel automatically expands the second operand to a 1-by-3 array and evaluates the formula as =SUM({1,2,3}*{4,4,4}). The formula's result equals 24, which is the sum of 1*4, 2*4, and 3*4.

When determining how to expand arguments, Microsoft Excel considers the dimensions of all the arguments used in the operation. Each argument must have the same number of rows as the argument with the greatest number of rows, and the same number of columns as the argument with the greatest number of columns.

If an argument is a single value, or a 1-by-1 array, Microsoft Excel expands the argument by repeating its single value as often as necessary to produce the desired array dimension. If an argument is a one-row or one-column array, Microsoft Excel expands the argument by repeating its one row or column of values. Otherwise, if an argument is an array with multiple rows and columns, Microsoft Excel expands it to the proper dimension by filling the array with the #N/A error value.

Microsoft Excel expands operands the same way it expands arguments.

MORE ABOUT

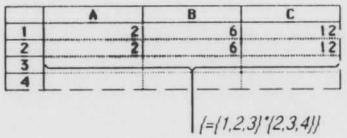
The following table shows how array operands and arguments are expanded:

In this formula	The arguments are expanded to this	And produce this result
=1+{1,2;3,4}	{1,1;1,1}+{1,2;3,4}	{2,3;4,5}
={1,2,3}*{2;3}	{1,2,3;1,2,3}*{2,2,2;3,3,3}	{2,4,6;3,6,9}
={1,2}+{1,2,3;4,5,6}	{1,2,#N/A;1,2,#N/A}+{1,2,3;4,5,6}	{2,4,#N/A;5,7,#N/A}
={1,2;3,4;5,6}+{1,2,3;4,5,6}	{1,2,#N/A;3,4,#N/A;5,6,#N/A}+{1,2,3;4,5,6;#N/A,#N/A,#N/A}	{2,4,#N/A;7,9,#N/A;#N/A,#N/A,#N/A}
=MOD({5,6,7},4)	MOD({5,6,7},{4,4,4})	{1,2,3}

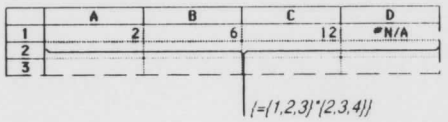
When entering an array formula, you should enter it in a range of cells with the same dimensions as the resulting array produced by the formula. Then, Microsoft Excel can place each value in the resulting array in one cell of the array range.

If an array formula produces an array smaller than the array range, Microsoft Excel expands the resulting array, as described earlier for arguments, before its values are placed in the array range. If the array formula produces an array larger than the array range, the excess values do not appear on the worksheet.

For example, the formula ={1,2,3}*{2,3,4} produces the 1-by-3 array {2,6,12}. If you enter this formula into a 2-by-3 array range, Microsoft Excel expands the result to {2,6,12;2,6,12}:



If you enter the formula into a 1-by-4 array range, Microsoft Excel expands the result to {2,6,12,#N/A}:



MORE ABOUT

Tips

Checking an Array for a Specific Value You can use the OR function in an array formula to see if an array contains a particular value. For example, if an array named List contains a list of account numbers, and if a cell named AccountNum contains one account number, then the following formula returns TRUE if the account number occurs anywhere in the list of account numbers.

=OR(AccountNum=List)

The formula itself must be entered as an array, or Microsoft Excel will check only the first element in the array of account numbers. The array formula automatically translates the single value AccountNum into an array that is the same size as List and then compares AccountNum to each element in List. For more information on how Microsoft Excel translates arrays and other data types, see "Converting Data Types" in the *Microsoft Excel Function Reference*.

Using Arrays in Custom Functions You can create custom worksheet functions that operate on arrays or produce arrays as results. In the custom worksheet function, you specify that the data type for an argument or result is the array data type rather than a single-value data type. For more information on creating custom functions, see Chapter 17, "Creating and Using Custom Worksheet Functions."

Plotting Array Constants on Charts You can enter array constants in a series formula on a chart if you want to plot a set of constants. For example, the formula =SERIES("Actual",{"Pens","Clips","Tape"},{10,20,30},1) plots the values 10, 20, and 30 in the categories Pens, Clips, and Tape, respectively. For information on using the series formula in a chart, see "Adding, Editing, and Deleting Chart Data" in Chapter 12.

Extracting Values from an Array You can use the array form of the INDEX function to extract a single value contained in an array range or to extract a row or column of values contained in an array range. You can then use the extracted value or values as part of another formula. For information on using the array form of the INDEX function, see the *Microsoft Excel Function Reference*.

Reducing the Size of an Array Range To reduce the size of an array range, first select the array, activate the formula bar, and press OPTION+ENTER to reenter the array formula as an ordinary formula. Then select the smaller range you want to contain the array, activate the formula bar, and press COMMAND+ENTER to enter the array formula. You can then select and clear the cells that were formerly part of the array but now contain ordinary formulas.

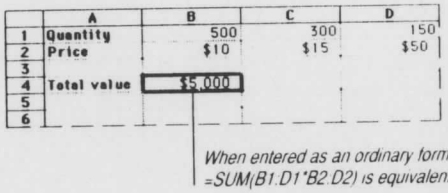
MORE ABOUT

Troubleshooting

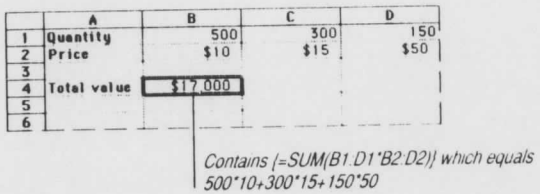
Selection Is Too Big to Contain an Array Formula Microsoft Excel allows arrays of up to approximately 6,500 elements. If you attempt to enter an array into a selection of more than the allowed number of cells, Microsoft Excel displays a message and does not enter the array formula. To enter an array into more than 6,500 cells, divide the array formula into several array formulas and enter each array formula in a smaller range.

Array Formula Produces a Single Result Instead of Multiple Results You probably entered the formula as an ordinary formula instead of an array formula. Make sure to hold down COMMAND when you enter the formula.

If you enter an array constant or cell range as an operand in an ordinary formula, the formula produces a different result than when it is entered as an array formula. In an ordinary formula, an operator operates on only the first item in an array constant and produces only a single result. For example, if you enter the formula ={1,2,3}+{2,3,4} as an ordinary formula, Microsoft Excel adds the first two values in each array and produces the single result 3. If you enter the formula as an array formula, it produces three results, 3, 5, and 7. If you enter cell ranges instead of array constants into an ordinary formula, the operator operates on only the cell values in the same row or column as the formula. If the formula is not in a common row or column with the cell range, the formula returns the #VALUE! error value. For example, if you enter the formula =SUM(B1:D1*B2:D2) as an ordinary formula in column B, only the values in cells B1 and B2 are multiplied:



However, if you enter the same formula as an array formula in a single cell, Microsoft Excel multiplies each value in cell range B1:D1 by the corresponding value in cell range B2:D2, and then sums the resulting array of products:



Seeking a Value That Solves a Formula

Often you know the value you want a formula to return, but not the values the formula needs to reach that value. To solve such a formula, you can use *goal seeking*. When you use goal seeking, Microsoft Excel varies the value in a cell you specify until a formula dependent on that cell returns the value you want. For example, you could use goal seeking to calculate the monthly sales revenues you need to maintain an 8 percent profit margin given that your monthly overhead is $1,650. Goal seeking saves you from time-consuming trial and error when doing "what-if" analysis.

Online Help also provides information on seeking a value that solves a formula. To display online Help, choose the Window Help command. If you are using system software version 7.0 and the Help command does not appear on the Window menu, display Help by pointing to the Help menu icon and choosing the Microsoft Excel Help command. For information on a specific command, select the Commands topic. For information on using online Help, see "Using Help" in Chapter 1.

Seeking a specific solution to a formula

To do this procedure, you must be using full menus.

1. Select the cell containing the formula for which you want to find a specific solution.
2. Choose Formula Goal Seek.
3. In the To Value box, enter the value you want.
4. In the By Changing Cell box, enter the reference of the cell containing the value to be changed in solving for the result you want.

   You can type the reference or select the cell. Be sure to enter the reference of a cell that contains a value that the original formula depends on, either directly or indirectly. Do not enter the reference of a cell containing a formula.
5. Choose OK.

   A dialog box shows the status of the goal seeking.
6. If you want to pause while goal seeking, choose the Pause button. Then you can use the Step button to continue goal seeking one step at a time. To continue normal goal seeking, choose the Continue button.

   When goal seeking is complete, Microsoft Excel displays the results. If the specific solution you want cannot be reached, Microsoft Excel displays a message.
7. If Microsoft Excel reaches the solution you want for your formula, choose OK to enter the solution value in the cell used in goal seeking. If you don't want to enter the solution value in the cell, choose Cancel.

   If you choose OK and replace an old value with the new solution but then change your mind, choose Edit Undo Goal Seek immediately after goal seeking is finished.

MORE ABOUT

More About Seeking a Value That Solves a Formula

Tips

Another Tool for Seeking Solutions Microsoft Excel includes another tool for finding solutions to formulas. Microsoft Excel Solver is a program that can find solutions to problems that have multiple variables and multiple limitations. For information on Solver, see the *Microsoft Excel Solver User's Guide* included in your Microsoft Excel package.

Using Names in Goal Seeking In the Goal Seeking dialog box, you can use names instead of references in the Set Cell and By Changing Cell boxes.

Using Iteration to Solve a Circular Reference Formula

When a formula refers back to its own cell, either directly or indirectly, it is called a *circular reference*. To solve such a formula, Microsoft Excel must use *iteration*, which is the repeated calculation of the worksheet until a specific numeric condition is met. Without iteration, Microsoft Excel is unable to calculate circular references because it is searching for a value that cannot be found.

For example, suppose you need to compute an employee bonus that is 10 percent of net profit, while the net profit depends on the amount of the bonus. Your gross profit is $1,000, your net profit equals the gross profit minus the bonus, and the bonus is 10 percent of the net profit. The following illustration shows the formulas to calculate the bonus and net profit:

	A	B
1	**Gross Profit**	1000
2	**Net Profit**	=Gross_Profit-Bonus
3	**Bonus**	=Net_Profit*10%
4		
5		

The formulas for the bonus and net profit contain a circular reference because each formula refers to the other. To calculate such formulas, you need to use iteration. With each iteration, Microsoft Excel calculates each cell involved in the circular reference once using the results of the previous iteration.

You control iteration with the Options Calculation command, either by limiting the number of iteration cycles or by setting a limit to the maximum amount of change in a value from one iteration cycle to the next. When Microsoft Excel calculates the worksheet, it calculates circular references until it either iterates the number of times set in the Maximum Iterations box or until all cells change by less than the amount in the Maximum Change box, whichever happens first.

Turning on iteration

1. Choose Options Calculation.
2. Turn on the Iteration check box.
3. In the Maximum Iterations box, type the maximum number of iterations you want Microsoft Excel to perform.

   The more iterations you specify, the longer your worksheet takes to calculate. For large worksheets, keep this number to around 100.
4. In the Maximum Change box, type the maximum change between iterations.

   The smaller the number you specify, the longer your worksheet takes to calculate and the more accurate your answer is.
5. Choose OK.

   Microsoft Excel displays the progress of iteration in the left side of the formula bar. To stop calculation while Microsoft Excel is iterating, press COMMAND+PERIOD.

MORE ABOUT

More About Using Iteration to Solve a Circular Reference Formula

Guidelines

Using the Default Settings for Iteration Unless you change the default settings for iteration, Microsoft Excel stops iterating after 100 iterations or after all values in the model change by less than 0.001 between iterations.

Iteration and the Order of Calculation Because Microsoft Excel calculates worksheets based on formula dependencies, the order of calculation is not by row or column. Therefore, do not build an iteration model that depends on the order of calculation.

Troubleshooting

Cannot Resolve Circular References Microsoft Excel cannot resolve formulas with circular references using normal calculation. When you make a circular reference, Microsoft Excel displays a message and the status bar indicates a cell involved in the circular reference. If the circular reference is accidental, you need to redesign the formulas or logic to break the circular reference. If you are using a circular reference intentionally, use the Options Calculation command to turn on iteration.

MORE ABOUT

If Iteration Cannot Reach a Solution During iteration, values usually move closer to the correct solution with each iteration. This is called *convergence*. Occasionally, however, values move farther away from the correct solution with each iteration. This is called *divergence*. If your equations diverge during iteration, try varying the initial values used in the equations by some constant amount. If you do get a convergent answer, you can multiply or divide all the values to return to your original initial values. Some sets of equations will diverge because they have no solution.

Controlling Calculation

Calculation is the process of computing formulas and then displaying the results as values in the cells containing the formulas. In Microsoft Excel, you can control when calculation occurs and you can use calculation options to control other aspects of calculation.

For information on	See
Entering formulas that calculate values	"Entering a Formula" in Chapter 3
Changing how calculated results are displayed	"Formatting Worksheet Data" in Chapter 5
Combining and automating formulas	Chapter 17, "Creating and Using Custom Worksheet Functions"
Referring to data in other applications	"Linking Documents" in Chapter 8

Online Help also provides information on controlling calculation. To display online Help, choose the Window Help command. If you are using system software version 7.0 and the Help command does not appear on the Window menu, display Help by pointing to the Help menu icon and choosing the Microsoft Excel Help command. For information on a specific command, select the Commands topic. For information on using online Help, see "Using Help" in Chapter 1.

Calculation in Microsoft Excel

To speed up worksheet calculation, Microsoft Excel calculates cells selectively. Whenever possible, Microsoft Excel updates only those cells affected by values you change, thus avoiding unnecessary calculations.

Microsoft Excel calculates on the basis of the underlying stored values in cells, rather than the values as you have formatted them to be displayed. This means that you can use the Format Number command to change the appearance of a cell without affecting its formula or stored value. You can specify that Microsoft Excel calculate formulas on the basis of displayed values, so you can see the results of calculating with the rounded figures shown on the worksheet. This is useful for calculating figures based on monetary amounts. For more information on calculating using the displayed values, see "Calculating Using the Displayed Values," later in this section.

While Microsoft Excel is calculating, you can choose commands or perform actions such as entering numbers or formulas. Microsoft Excel temporarily interrupts calculation to carry out the other commands or actions and then resumes calculation. While Microsoft Excel is calculating your worksheet, it displays the number of cells being calculated, to the left of the formula bar. If the calculation is completed quickly, this message may not be displayed.

When you start Microsoft Excel for the first time, calculation is automatic. This means that immediately after you make changes in a document, Microsoft Excel calculates any formulas affected. You can set calculation so it occurs only when you want it to by selecting the Manual option in the Options Calculation dialog box. When calculation is manual, you must choose the Options Calculate Now command to start calculation. You can choose to calculate all open documents or just the active worksheet.

You can also freeze formulas by replacing them with their resulting values, save worksheets without first calculating them, and specify other calculation-related options, such as what starting date to use for date serial numbers.

NOTE Microsoft Excel doesn't calculate macro sheets as it does worksheets. Formulas in a macro sheet are calculated one formula at a time and only when the macro or custom worksheet function on the macro sheet is run. For information on using macro sheets, see "Creating and Opening a Macro Sheet" in Chapter 18.

Using Manual Calculation

Whenever possible, Microsoft Excel calculates only the formulas affected by changes but you can further speed up the response time of Microsoft Excel by changing from automatic to manual calculation. You may want to do this when entering or editing many formulas in a complex worksheet. Changing to manual or automatic calculation affects the way all open worksheets are calculated.

Switching to manual calculation also saves time if you are working with charts, because, with automatic calculation, Microsoft Excel redraws any open charts linked to or created on the active worksheet when you change worksheet values on which the charts depend. And, because data tables slow calculation, you may not want to calculate them every time you enter a new value on the worksheet. If, however, you still want all other formulas calculated automatically, you can select the Automatic Except Tables option in the Options Calculation dialog box.

When you change to manual calculation, you need to tell Microsoft Excel each time you want to calculate your documents. Also, if you set calculation to Automatic Except Tables, you must tell Microsoft Excel to start calculation each time you want to update the data tables. You can choose to calculate all open documents or only the active worksheet.

After you start calculation in Microsoft Excel, you can switch to another application—such as a word processor—while Microsoft Excel completes the calculation.

Switching between manual and automatic calculation

1. Choose Options Calculation.
2. To switch to manual calculation, select the Manual option.

   To switch to automatic calculation, select the Automatic option.

   To switch to automatic calculation for all formulas except data tables, select the Automatic Except Tables option.
3. Choose OK.

Calculating all open documents

When calculation is set to manual, you use this procedure to calculate all open worksheets and macro sheets, including data tables, and to update all open chart documents. When calculation is set to Automatic Except Tables, use this procedure to calculate data tables.

▶ Choose Options Calculate Now.

If a chart document is active, choose Chart Calculate Now.

NOTE If you choose the Options Calculate Now command while the formula bar is active, the command performs a different function: it replaces the formula or the selected part of the formula in the active cell with the calculated result of the formula or partial formula.

Calculating the active worksheet only

When calculation is set to manual, use this procedure to calculate only the active worksheet and update only the charts on the worksheet and open charts linked to the worksheet.

1. Make sure the worksheet you want to calculate is active.
2. Hold down SHIFT and select the Options menu.
3. Choose Calculate Document.

Replacing a Formula with Its Calculated Value

Your worksheet may contain formulas whose values you want to freeze. For example, if you close out your worksheet at the end of the month, you may want to make certain values permanent. You can do so by replacing the underlying formulas with the calculated values.

Replacing formulas with their resulting values speeds up worksheet calculation and is particularly useful if you build new sets of worksheets that always depend on existing worksheets for certain values. For example, if your worksheet for the current month always starts with the closing values from the previous month's worksheet, replacing the formulas in the previous month's worksheet with values reduces calculation time when you open both worksheets. You can use the Options Calculate Now command while the formula bar is active to replace a single formula with its calculated value, or you can use the Edit Copy and Edit Paste Special commands to freeze the values in a range of cells.

Also, if you want to use a constant in a formula, but you need to perform one or more mathematical operations to determine the constant, such as multiplying two values, you don't have to resort to your calculator or a separate formula. Instead, you can type the entire formula in the formula bar, including the portion that calculates the constant, select the portion of the formula that calculates the constant, and calculate it before entering the entire formula.

IMPORTANT Replacing a formula with its value permanently removes the formula. If you inadvertently replace a formula with a value and want to restore the formula, choose the Edit Undo Entry command immediately after entering or pasting the value. Or, if the formula bar is still active, click the cancel box or press COMMAND+PERIOD to restore the previous entry.

Replacing an entire formula with its calculated value

1. Select the cell containing the formula you want to replace with the resulting value.
2. Activate the formula bar.
3. Choose Options Calculate Now.
4. Click the enter box or press ENTER.

Freezing the values in a range of cells

To do this procedure, you must be using full menus.

1. Select the cells containing the formulas you want to replace with their resulting values.
2. Choose Edit Copy.
3. Choose Edit Paste Special.
4. Under Paste, select the Values option.
5. Choose OK.

Calculating a portion of a formula

1. Select the cell containing the formula or type the formula in the formula bar.
2. In the formula bar, select the portion of the formula you want to calculate.
3. Choose Options Calculate Now.
4. Click the enter box or press ENTER.

Calculating Using the Displayed Values

When you create a new worksheet, Microsoft Excel stores values at full precision—15 digits—and all calculations use the entire stored value no matter how the values are formatted and displayed. If you display numbers with less precision than their stored values, the displayed numbers are rounded. This may cause some formulas to display results that appear incorrect, although the underlying values are correct. For example, if two cells each contain the value 23.006, and you add them together in a third cell, the result is 46.012. If all three cells are formatted to display only two decimal places, the result is 23.01+23.01=46.01, which appears to be wrong. On the other hand, if you calculate the worksheet with the displayed values, the result is 23.01+23.01=46.02.

You can tell Microsoft Excel to calculate a worksheet on the basis of the displayed values instead of the stored values by turning on the Precision As Displayed check box in the Options Calculation dialog box; this option affects only the active worksheet. The Precision As Displayed check box does not affect numbers formatted in the General number format. Numbers in General format are always calculated with full precision. Turning on the Precision As Displayed check box slows calculation because Microsoft Excel must round off the numbers as it calculates.

IMPORTANT Turning on the Precision As Displayed check box for a worksheet permanently changes constant values stored on the worksheet to their displayed values. Turning off the Precision As Displayed check box does not restore the original full precision values. Because you lose accuracy with precision as displayed, Microsoft Excel asks you to confirm the change.

Calculating with precision as displayed

1. Choose Options Calculation.
2. Turn on the Precision As Displayed check box.
3. Choose OK.

   Microsoft Excel displays a message asking for confirmation.
4. Choose OK.

Saving Worksheets Without Calculating

Normally, Microsoft Excel always calculates a worksheet before saving it. However, if you are working with a worksheet that is very large and takes a while to calculate, you may want to be able to save it without calculating first.

Turning off calculation before saving

1 Choose Options Calculation.

2 Select the Manual option.

3 Turn off the Recalculate Before Save check box.

4 Choose OK.

Microsoft Excel now saves your worksheets without first calculating them. When you want to calculate your worksheets, choose the Options Calculate Now command.

NOTE If a worksheet contains a formula that is linked to an unrecalculated worksheet and you update that link, Microsoft Excel displays a message telling you that the source worksheet is not completely calculated. Choose OK to update the link with the current value stored on the source worksheet, even though the value may be incorrect. Choose Cancel to cancel the link update and use the previous value obtained from the source worksheet.

You can also save an uncalculated worksheet by pressing COMMAND+PERIOD while Microsoft Excel is calculating after you choose the File Save command. Microsoft Excel displays a message telling you that calculation is incomplete and asking if you want to calculate before saving. To finish the calculation, choose the Yes button. To save the worksheet without calculating, choose the No button. To cancel the save and return to Microsoft Excel, choose the Cancel button.

IMPORTANT Canceling the File Save command when your disk is almost completely full may interfere with the save process. To avoid possibly losing data, do not cancel the File Save command.

Changing Date Systems

Microsoft Excel stores dates as serial numbers. The serial number that corresponds to a date differs depending on the date system that was in effect when you entered the dates.

Microsoft Excel offers two date systems—the 1900 date system and the 1904 date system. The 1900 date system is the date system used by Microsoft Excel for Windows or Microsoft Excel for OS/2, and by Lotus 1-2-3. In the 1900 date system, the serial number 1 corresponds to the date January 1, 1900, the serial number 2 corresponds to January 2, 1900, and so on. The 1904 date system is the date system used by Microsoft Excel for the Apple Macintosh. In the 1904 date system, the date serial number 1 corresponds to the date January 2, 1904, the date serial number 2 corresponds to January 3, 1904, and so on.

You can change the date system for a worksheet using the Options Calculation command. When entering dates that you want to be compatible with Lotus 1-2-3, use the 1900 date system. Also use the 1900 date system for a worksheet if the other worksheets you will be using with that worksheet use the 1900 date system.

When entering dates that you want to be compatible with Microsoft Excel for the Macintosh version 1.5 or earlier, use the 1904 date system. Also use the 1904 date system for a work-sheet if the other worksheets you will be using with that worksheet use the 1904 date system.

IMPORTANT Changing the date system affects only the active worksheet and only new dates that are entered. Dates that have already been entered are not converted when you change date systems; the date serial numbers for already entered dates remain the same but those date serial numbers produce different dates after you change date systems. Therefore, you should always choose the date system you want to use for a worksheet before entering any dates in the worksheet.

Switching between the 1904 and 1900 date systems

1 Choose Options Calculation.

2 To use the 1904 date system, turn on the 1904 Date System check box.

To use the 1900 date system, turn off the 1904 Date System check box.

3 Choose OK.

For more information on dates in Microsoft Excel, see "Entering Worksheet Data" in Chapter 3.

MORE ABOU

More About Controlling Calculation

Guidelines

Making Manual Calculation the Default Calculation Setting Microsoft Excel always sets calculation to match the setting used for the first opened worksheet when you start Microsoft Excel. If you start the Microsoft Excel application without opening an existing document, so that Microsoft Excel creates a new worksheet when it starts up, calculation is set to automatic even if you had set calculation to manual before you last quit Microsoft Excel. If you want Microsoft Excel to set calculation to manual when you first start Microsoft Excel, do not start the Microsoft Excel application directly, but open a worksheet that was saved when calculation was set to manual. Opening the worksheet starts Microsoft Excel and causes Microsoft Excel to use the calculation setting used when that worksheet was saved.

Resolving Circular References You can use Microsoft Excel to calculate formulas that depend on each other for their results or to solve simultaneous equations. If two formulas depend on each other for their results and, therefore, contain references to each other, Microsoft Excel displays a message warning you that it cannot resolve the circular reference. For these formulas, you can use the iteration options in the Options Calculation dialog box to find the values that resolve both equations.

For more information on using iteration, see the preceding section, "Using Iteration to Solve a Circular Reference Formula."

Circular references can also occur due to faulty logic on the worksheet or incorrect cell references in formulas. To find the references that are causing the circular reference, you can use the Info window to view and trace the dependencies of cell formulas on each other. For information on tracing worksheet logic, see "Auditing a Worksheet" in Chapter 6.

Updating References to Data in Other Applications If you want Microsoft Excel to automatically update formulas with references to data in other applications, choose Options Calculation and turn on the Update Remote References check box. If this check box is turned off, Microsoft Excel uses the last values received from the other application to calculate the formulas. This option affects the active worksheet only. For more information on referring to data in other applications, see "Linking Documents" in Chapter 8.

Reducing Disk Space Required for Linked Worksheets When a worksheet has links to another document, Microsoft Excel saves copies of the values from the external document. If a worksheet with several links to a large external document requires an unusually large amount of disk space, turn off the Save External Link Values check box in the Options Calculation dialog box.

Working with Data from Multiple Documents

With Microsoft Excel, you can save time by editing similar worksheets as a group; your changes in one worksheet are duplicated in the other worksheets in the group. You can link, share, and transfer data between Microsoft Excel documents, and you can also create links and exchange data between Microsoft Excel documents and documents from other applications. With system software version 7.0 you can share data between documents or applications by publishing portions of your Microsoft Excel documents as editions and by subscribing to editions created by other documents. You can also create summary worksheets or reports by consolidating data from many different documents.

NOTE Unless otherwise noted, all information and procedures for working with worksheets also apply to macro sheets.

Table of Contents

Editing Worksheets as a Group ... 293
Linking Documents ... 299
Creating Publishers and Subscribers ... 317
Embedding Objects ... 321
Consolidating Data from Multiple Worksheets ... 324
Exchanging Data Using the Clipboard ... 331
Exchanging Documents with Other Applications ... 334
Using Dynamic Data Exchange (DDE) in Command Macros ... 337
Transferring Files with Microsoft Mail ... 341

Editing Worksheets as a Group

With Microsoft Excel, you can save time by entering and editing data, formatting cells, and changing display options in several worksheets at the same time. You do this by defining similar worksheets as a *workgroup*. All your changes in the active worksheet are duplicated in all the sheets in the workgroup.

When you define worksheets and macro sheets as part of a workgroup, you can use many of the Microsoft Excel file management, editing, and formatting commands to complete your work more quickly. For example, if you apply a custom number format to a range of cells in the active worksheet, Microsoft Excel applies that format to the same range in all the other sheets in the workgroup. If you change your mind, you can choose Edit Undo, and Microsoft Excel reverses the formatting change not only on the active worksheet, but also on the other sheets in the workgroup.

When you want to create several documents at the same time, you can use a document template. To add additional data or formatting to these documents, you can define them as a workgroup and then make your changes all at one time.

You can also print several worksheets and macro sheets at the same time by defining them as a workgroup before choosing the File Print command.

NOTE You can define only one workgroup at a time. A workgroup can consist of only worksheets and macro sheets; you cannot include a chart in a workgroup.

For information on	See
Entering text, numbers, and formulas	"Entering Worksheet Data" and "Entering a Formula" in Chapter 3
Worksheet editing techniques	"Editing Worksheet Data" in Chapter 3 and Chapter 4, "Editing a Worksheet"
Worksheet formatting techniques	Chapter 5, "Formatting a Worksheet"
Printing a worksheet	Chapter 15, "Printing"
Using a document template	"Creating and Using a Document Template" in Chapter 16

Online Help also provides information on editing worksheets as a group. To display online Help, choose the Window Help command. If you are using system software version 7.0 and the Help command does not appear on the Window menu, display Help by pointing to the Help menu icon and choosing the Microsoft Excel Help command. For information on a specific command, select the Commands topic. For information on using online Help, see "Using Help" in Chapter 1.

Creating a workgroup

To do this procedure, you must be using full menus.

1. Open the worksheets and macro sheets you want to include in a workgroup.

   You can also have other documents open that you don't want to include in the workgroup.

2. Activate the sheet in which you want to enter text and make changes.

   This sheet contains the active cell. Any changes you make to this sheet will be duplicated in the other sheets in the workgroup.

3. Choose Window Workgroup.

   Microsoft Excel displays a list of all open, nonhidden worksheets and macro sheets in the Select Workgroup box.

   If you have already defined a workgroup in the current session, Microsoft Excel selects those documents in the Select Workgroup box.

4. In the Select Workgroup box, select the names of the sheets you want to include in the workgroup.

   To select several sheets at one time, hold down SHIFT and drag through the names of the sheets you want to include in the workgroup. To select only some of the sheets listed in the Select Workgroup box, hold down COMMAND and click the name of each sheet you want to include in the workgroup.

5. Choose OK.

   Microsoft Excel adds "[Workgroup]" to the names of the worksheets or macro sheets. The sheet that contains the active cell is on top.

For a description of how Microsoft Excel commands function in a workgroup, see "More About Editing Worksheets as a Group," later in this section.

Displaying all the sheets in a workgroup

As you work in a document that is part of a workgroup, you may want to see on your screen how your changes in the active sheet are duplicated in the other sheets in the workgroup. The Arrange Workgroup command appears on the Window menu only after you create a workgroup.

▶ Choose Window Arrange Workgroup.

Microsoft Excel arranges all the workgroup windows on the workspace. Other open documents that are not part of the workgroup are not displayed.

Changing the workgroup

Use the following procedure to add a sheet to or remove a sheet from the workgroup.

To do this procedure, you must be using full menus.

1. Choose Window Workgroup.

   Microsoft Excel displays a list of all open, nonhidden worksheets and macro sheets in the Select Workgroup box. The sheets that are part of the current workgroup are selected.

2. To add a sheet to or delete a sheet from the workgroup, hold down COMMAND and click the sheet name.

   The selected names in the Select Workgroup box are the sheets that belong to the workgroup.

3. Choose OK.

Entering data in a workgroup

1. Create the workgroup.
2. In the active sheet, select the cell or cell range in which you want to enter data.
3. Type the data.

   In the active sheet, the data you type appears in the formula bar and in the active cell.

4 To enter the data, click the enter box or press ENTER.

To delete the data, click the cancel box or press COMMAND+PERIOD.

The data you enter in the active cell in the active worksheet is duplicated in the same location in all the sheets in the workgroup. If you delete the data in the active cell, Microsoft Excel also deletes it from the cell in the same location in all the sheets in the workgroup.

Copying data in a workgroup

You can copy cell contents and formats from a cell range in one sheet to the same cell range in the other sheets in the workgroup. The Fill Workgroup command appears on the Edit menu only after you create a workgroup.

To do this procedure, you must be using full menus.

1 Create the workgroup.

2 In the active sheet, select the cells you want to copy.

You can select a cell, a range, or the entire sheet.

3 Choose Edit Fill Workgroup.

4 To copy cell contents, formulas, and formatting, select the All option.

To copy only the formulas, select the Formulas option.

To copy only the formatting, select the Formats option.

5 Choose OK.

Microsoft Excel copies the selected cells to the same location in all the sheets in the workgroup.

Ending a workgroup data-entry or editing session

- To end a workgroup session, activate any other sheet by clicking it or by choosing its name from the Window menu.

The workgroup is no longer defined. The "[Workgroup]" designation is removed from the title bars of the sheets in the workgroup, the Window Arrange Workgroup command reverts to Window Arrange All, and the Edit Fill Workgroup command is dimmed.

MORE ABOUT

More About Editing Worksheets as a Group

Guideline

Microsoft Excel Commands That Can Be Applied to Workgroups The following table lists all the Microsoft Excel commands that can be applied to workgroups and describes the effect of each command on workgroup editing. Some commands, such as Edit Fill Workgroup and Window Arrange Workgroup, are available only when a workgroup is defined.

MORE ABOUT

Command name	Effect on a workgroup
Data Series	Enters a data series in all sheets in the workgroup. If the starting values are different on each sheet, then the data series itself will be different.
Edit Clear	Clears the selected cells in all sheets in the workgroup.
Edit Delete	Deletes the selected cells in all sheets in the workgroup.
Edit Fill Down/Up	Fills cells down or up in the same selection in all sheets in the workgroup.
Edit Fill Right/Left	Fills cells right or left in the same selection in all sheets in the workgroup.
Edit Fill Workgroup	Copies the active sheet's selection to the same location in all sheets in the workgroup.
Edit Insert	Inserts the selected cells in all sheets in the workgroup.
File Close	Closes all sheets in the workgroup, one at a time.
File Close All	Closes all sheets in the workgroup, one at a time.
File Page Setup	Applies all settings to all sheets in the workgroup.
File Print	Prints all sheets in the workgroup, one at a time.
File Save	Saves all sheets in the workgroup, one at a time.
File Save Workspace	Saves all sheets in the workgroup as a workspace file.
Format Alignment	Aligns data in the same cells in all sheets in the workgroup.
Format Border	Applies borders to the same cells in all sheets in the workgroup.
Format Cell Protection	Applies cell protection to the same cells in all sheets in the workgroup.
Format Column Width	Changes the width of the same columns in all sheets in the workgroup.
Format Font	Changes the font in the same cells in all sheets in the workgroup.
Format Number	Applies a built-in or custom number format to the same cells in all sheets in the workgroup. If you delete a custom number format, Microsoft Excel deletes this format from all sheets in the workgroup that have that format.
Format Patterns	Applies cell patterns and shading to the same cells in all sheets in the workgroup.
Format Row Height	Changes the height of the same rows in all sheets in the workgroup.

Command name	Effect on a workgroup
Format Style	Applies a style to the same cells in all sheets in the workgroup.
Formula Goto	Selects the named area or reference in the sheet in which you're entering and editing data.
Formula Paste Function	Pastes a function in the formula in all sheets in the workgroup.
Formula Show Active Cell	Displays the active cell in the sheet in which you're entering and editing data.
Macro Absolute/Relative Record	Changes the macro setting in all sheets in the workgroup.
Macro Record	Records a macro in all sheets in the workgroup.
Macro Run	Runs a macro in all sheets in the workgroup.
Macro Start Recorder	Available only if you used the Macro Set Recorder command on a single macro sheet before creating a workgroup. To prevent the macro sheet from being overwritten with changes, it must not be included in the workgroup.
Options Calculate Now	Calculates all formulas in all sheets in the workgroup.
Options Short Menus	Displays short menus on all sheets in the workgroup.
Options Workspace	Applies all settings to all sheets in the workgroup.
Window Arrange Workgroup	Arranges only the windows of the workgroup on the workspace.

Tips

Identifying Sheets in a Workgroup If you created a workgroup in the current Microsoft Excel session and don't remember which sheets are included in the workgroup, you can:

- Check the name of the worksheet or macro sheet in the title bar. Any sheet names followed by "[Workgroup]" are part of the workgroup.
- Select the Window menu. The names of worksheets and macro sheets included in the workgroup are preceded by a check mark.
- Choose the Window Workgroup command. The sheets that are part of the workgroup are selected.

Saving Memory To save memory when you enter and edit data in a workgroup, open only the sheets that are in the workgroup.

Linking Documents

You can dynamically link separate worksheets so that any changes you make in one worksheet are immediately reflected in the linked worksheet. Whenever you build a formula or define a name in one worksheet by using an *external reference*—a reference to a cell, cell range, or name from another worksheet—Microsoft Excel links those worksheets. A linking formula is recalculated whenever you change the data it refers to.

You can create two types of links:

- A link between two or more Microsoft Excel worksheets or macro sheets, or between a worksheet and a chart
- A link between a Microsoft Excel worksheet or chart and a document in another application

For information on	See
Linking to a Lotus 1-2-3 worksheet	"Linking 1-2-3 Worksheets and Microsoft Excel Worksheets" in Chapter 2
Linking to publication files in system software version 7.0	"Creating Publishers and Subscribers" following in this chapter
Using names in cell references	"Naming Cells and Formulas" in Chapter 6
Linking worksheet data to a chart	Chapter 11, "Creating a Chart"
Embedding a chart on a worksheet	
Embedding an object	"Embedding Objects" later in this chapter

Online Help also provides information on linking documents. To display online Help, choose the Window Help command. If you are using system software version 7.0 and the Help command does not appear on the Window menu, display Help by pointing to the Help menu icon and choosing the Microsoft Excel Help command. For information on a specific command, select the Commands topic. For information on using online Help, see "Using Help" in Chapter 1.

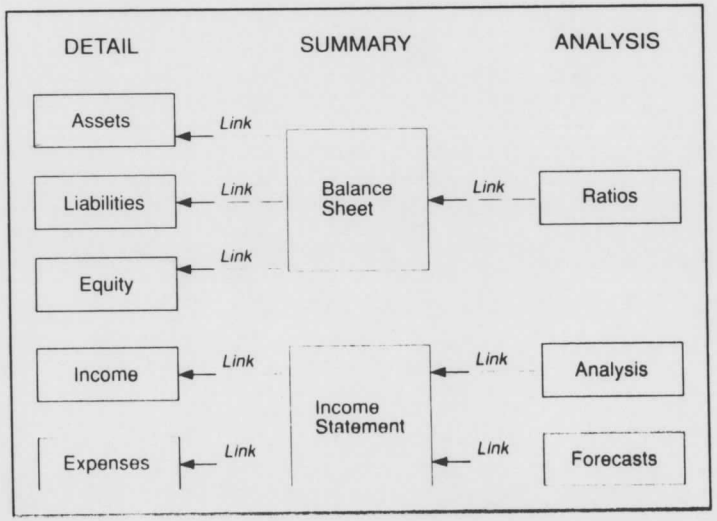
When to Link Worksheets

Linking is especially useful for working with large worksheet models or systems of documents. Here are a few ways you can use linking most effectively:

- **Consolidating data from several worksheets, data sources, or different applications** For example, you can link worksheets from several users or departments and integrate the pertinent data into a master summary worksheet. When you break down a large model into smaller linked worksheets, several users who must enter data into the model can work on it at the same time. You can also use Microsoft Excel worksheets to consolidate data from other applications, such as financial databases.

- **Creating different "views" of your data** You can use one worksheet as the source for several reports. For example, you can create a working copy of the data that includes comments, data tables, intermediate results, and no special formats. You can then create a final version of this worksheet for a report, including special formats and data pertinent only to the report, and link it to your working copy.
- **Streamlining large, complex models** By breaking down a complicated model into a series of compact, interdependent worksheets, you save memory because you can work on the model without opening all its related worksheets. Smaller worksheets are easier to edit and faster to open, save, and calculate.
- **Designing flexible models or systems** For example, you can design an effective model using separate worksheets for data you work with daily and data you work with only periodically. Again, more compact worksheets can streamline your work significantly.

Linking is not restricted to links between two documents; you can construct hierarchies of linked documents. For example, the following illustration shows an accounting model based on worksheets linked this way:



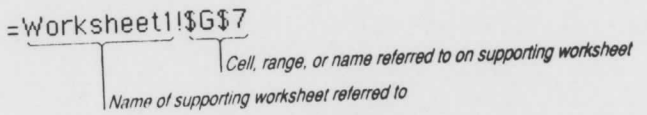
The following terms apply to linking worksheets:

- **External reference** A reference to another Microsoft Excel worksheet. An external reference can designate a single cell, a cell range, or a named cell or range.

- **External reference formula** A formula in a worksheet that contains a reference to a single cell, cell range, or named cell or range in another worksheet. An external reference formula creates the link between Microsoft Excel worksheets.
- **Remote reference** A reference to a document in another application; for example, Microsoft Word. A remote reference can designate a single cell, cell range, value, or field of data in the other document.
- **Remote reference formula** A formula in a Microsoft Excel worksheet that contains a reference to a cell, cell range, value, or field of data in a document from another application. A remote reference formula creates the link between a Microsoft Excel worksheet and the other document.
- **Linking formula** A formula in a Microsoft Excel worksheet that creates a link to another document. A linking formula can be either an external reference formula or a remote reference formula.
- **Dependent worksheet** A worksheet that contains an external reference formula or a remote reference formula. When you link two Microsoft Excel worksheets, the dependent worksheet relies on another worksheet for the value in the external reference formula. When you link a Microsoft Excel worksheet to a document in a different application, the worksheet is dependent on that document for the value in the remote reference formula.
- **Supporting document** A document referred to by an external reference formula or a remote reference formula. The supporting document is the source of the value contained in the external reference formula or remote reference formula and therefore provides supporting data to the dependent worksheet.

Linking Microsoft Excel Worksheets

You link two Microsoft Excel documents by creating a formula in one document that refers to a value in the other. The linking formula contains an external reference. An external reference consists of the document name and a reference, separated by an exclamation point. The following illustration shows the parts of an external reference formula:

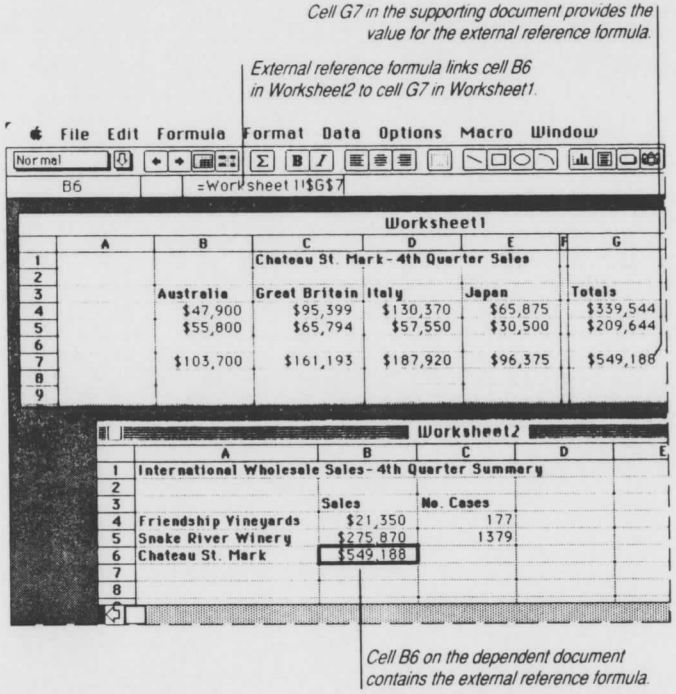


An external reference formula must use this syntax:

- **Name of the worksheet referred to** The worksheet name must be immediately followed by an exclamation point (!). The worksheet name can be any valid Microsoft Excel name. If it includes a pathname, enclose it in single quotation marks. For guidelines to follow when defining a name, see "Naming Cells and Formulas" in Chapter 6.

- **Cell, range, or named cell or range referred to** This part of the formula must immediately follow the exclamation point (!). It can be an absolute reference to a cell, cell range, or named cell or range in the other worksheet. It can also be a relative reference or a name that refers to a formula instead of cells.

The external reference formula in the following example is used to link two Microsoft Excel worksheets. The link tells Microsoft Excel to update the value in the linking formula in Worksheet2 whenever the value in Worksheet1 changes. Worksheet2 is the dependent worksheet and Worksheet1 is the supporting worksheet because the formula in Worksheet2 depends on cells in Worksheet1.


Cell G7 in the supporting document provides the value for the external reference formula.
External reference formula links cell B6 in Worksheet2 to cell G7 in Worksheet1.
File Edit Formula Format Data Options Macro Window
Normal
B6
=Worksheet1!$G$7
Worksheet1
Chateau St. Mark - 4th Quarter Sales
Australia
Great Britain
Italy
Japan
Totals
$47,900 $95,399 $130,370 $65,875 $339,544
$55,800 $65,794 $57,550 $30,500 $209,644
$103,700 $161,193 $187,920 $96,375 $549,188
Worksheet2
International Wholesale Sales - 4th Quarter Summary
Sales
No. Cases
Friendship Vineyards $21,350 177
Snake River Winery $275,870 1379
Chateau St. Mark $549,188
Cell B6 on the dependent document contains the external reference formula.

Creating a linking formula is just as easy as creating any other type of formula, because you can use the mouse to select the cells in another worksheet that you want the formula to refer to. When you use the following procedure to link two worksheets, Microsoft Excel uses absolute references to create the external reference formula. If you copy the formula to another location on the dependent worksheet, it still refers to the same cells on the supporting worksheet.

NOTE To make it easy to move between documents, choose the Window Arrange All command to display both windows in the workspace at the same time.

Linking a range of cells

To do this procedure, you must be using full menus.

1. Open the dependent worksheet and the supporting document you want to link.

   The supporting document can be another worksheet or a macro sheet.

2. Activate the supporting document window.
3. Select the cell or cell range you want to refer to.
4. Choose Edit Copy.

   The marquee appears around the selected cell or range.

5. Activate the dependent worksheet window.
6. Select the cell or the upper-left corner of the range that will contain the external reference.
7. To paste data into cells, choose Edit Paste Link.

   To paste a picture of the data at the active cell location, hold down SHIFT and choose Edit Paste Picture Link. If the data is text, Microsoft Excel pastes the data as a linked picture of cells.

   Microsoft Excel creates an external reference formula that links the worksheets. This formula appears in the formula bar.

8. To cancel the marquee, choose another command, activate the formula bar, or press COMMAND+PERIOD.

You can also create a link by typing the external reference formula in the formula bar. For example, typing **=worksheet1!a1** as the formula for a cell links that cell to cell A1 in Worksheet1. For information on entering formulas, see "Entering a Formula" in Chapter 3.

Creating a linking formula that uses functions

Use this procedure when you want to create a link that uses a function instead of constant values in cells. For example, you can create a link from a cell range in the dependent worksheet by creating the formula: =SUM(Sales!$D$1:$D$50).

1. Open the dependent worksheet and the supporting document you want to link.

   The supporting document can be another worksheet.

2. In the dependent document, select the cell in which you want to enter the external reference formula.
3. In the formula bar of the dependent document, paste or type the function you want to use.

4 Use the mouse to select the cell or range on the supporting document, or type the reference of a cell or range on the supporting document in the formula bar.

5 When you finish entering the formula, click the enter box or press ENTER.

Microsoft Excel creates the external reference formula that links the worksheets.

For information on entering formulas and functions, and editing in the formula bar, see Chapter 3, "Creating and Using a Worksheet."

Saving Linked Worksheets

In general, always save supporting documents before saving the dependent worksheet linked to them. This ensures that document names in external references are current. If you name or rename a supporting document, the dependent worksheet must be open for the name to be updated in the external reference. For more information on saving, see "Saving a Worksheet" in Chapter 3.

If you try to save a dependent document that contains a reference to an unnamed supporting document, Microsoft Excel displays a message. Choose the Cancel button and perform one of the following procedures.

Saving unnamed linked worksheets

1 Activate the supporting document window.

2 Choose File Save As.

3 In the Save Worksheet As box, type a document name.

4 Choose the Save button.

5 Repeat steps 1 through 4 for each additional supporting document.

6 Activate the dependent worksheet window.

7 Choose File Save As.

8 In the Save Worksheet As box, type a document name.

9 Choose the Save button.

Saving changes in previously linked worksheets

1 Activate the supporting document window.

2 Choose File Save.

3 Repeat steps 1 and 2 for each additional supporting document.

4 Activate the dependent worksheet window.

5 Choose File Save.

IMPORTANT If you save linked worksheets in different folders, make sure that you use the File Save As command to save all supporting worksheets before you save the dependent worksheet. Saving the supporting sheets first ensures that the external references in the dependent sheet are saved correctly. For more information, see "Managing Linked Documents in Different Folders," later in this section.

Opening and Updating Linked Worksheets

You can use the File Links command to display a list of the supporting documents for the active dependent worksheet as well as open one or more of the supporting documents. You can also use this command to update values in the active dependent worksheet with information from the supporting documents you select, or you can change links from dependent worksheets to other supporting documents. The supporting documents do not have to be open.

Follow these guidelines for opening and updating linked worksheets:

- **External references for closed or open supporting worksheets** External references are displayed differently in the dependent worksheet, depending on whether the supporting worksheets are open. If the supporting document is closed, the external reference is displayed in the formula bar with the full folder information—disk, folder name, and document name (for example, Disk:Tables:Tax!$A$1). If the supporting document is open, the external reference is displayed without the disk and folder name (for example, Tax!$A$1).
- **Worksheets with the same document name in different folders** If you have multiple supporting worksheets with the same document name in different folders, you can open only one of those documents at a time. For example, if you open a document called East from the Work:Regions folder, you cannot also open a document called East from a different folder.

IMPORTANT If you have renamed a supporting worksheet or have saved either a supporting or dependent worksheet in a different folder, you may have to redirect the links. For more information, see "Managing Linked Documents in Different Folders," later in this section.

Opening, viewing, or updating supporting documents

To do this procedure, you must be using full menus.

1 Activate the dependent worksheet.

2 Choose File Links.

3 In the Link Type box, select the type of links you want to display.

In the Links box, Microsoft Excel displays a list of all the supporting worksheets and charts for the active dependent worksheet with the type of link selected in the Link Type box.

4 In the Links box, select the supporting documents you want to open or update.

To select several documents at one time, hold down SHIFT and drag through the names of the documents you want to open or update. To select only some of the documents listed in the Links box, hold down COMMAND and click the name of each document you want to open or update.

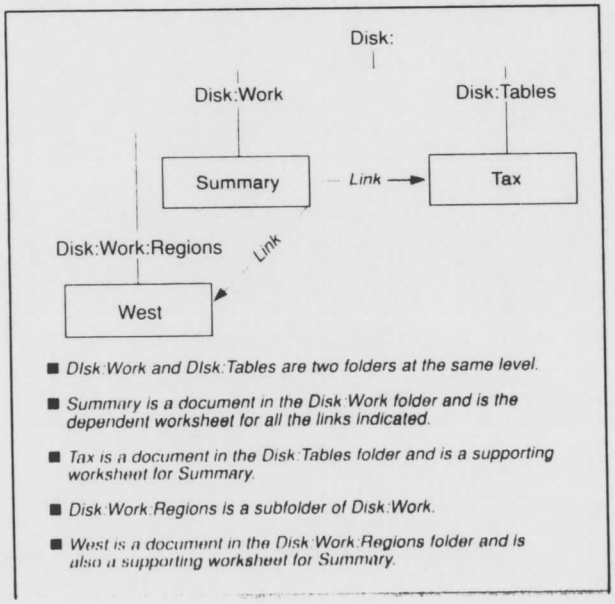
5 To open the selected supporting documents, choose the Open button.

To update values in the active dependent worksheet without opening the supporting documents, choose the Update button.

If you are just viewing the list, choose the Cancel button when you are finished.

Managing Linked Documents in Different Folders

Whenever possible, you should try to save linked documents in the same folder. However, you might find it more efficient to set up certain models with linked worksheets in different folders, as shown in the following illustration:


Disk:
Disk:Work
Disk:Tables
Summary
Link
Tax
Disk:Work:Regions
Link
West
■ Disk:Work and Disk:Tables are two folders at the same level.
■ Summary is a document in the Disk:Work folder and is the dependent worksheet for all the links indicated.
■ Tax is a document in the Disk:Tables folder and is a supporting worksheet for Summary.
■ Disk:Work:Regions is a subfolder of Disk:Work.
■ West is a document in the Disk:Work:Regions folder and is also a supporting worksheet for Summary.

Follow these guidelines when you work with linked worksheets in different folders:

- Save the supporting documents before saving the dependent worksheet to maintain links correctly.
- If you move Microsoft Excel documents between folders, you should also move all linked worksheets stored in the same folders or subfolders.

  This is because Microsoft Excel tracks linked worksheets in "relative" terms if the worksheets are originally stored in the same folder or in one of its subfolders. In the preceding example, Microsoft Excel tracks the external reference in Summary to West as "one folder down." However, Microsoft Excel tracks supporting worksheets outside a given folder (or its subfolders) in "absolute" terms (like an absolute reference in a formula). For example, if you move Summary to a different folder, you should also create a Regions subfolder in that folder and move West to the Regions subfolder to maintain the links correctly. However, if you moved Summary to a new folder, its link to Tax would not be affected.

If you don't follow these guidelines, your links may become disconnected. When you try to open a dependent worksheet, Microsoft Excel displays a message indicating that it can't find the supporting worksheet. If this happens, use the File Links command to redirect links for dependent or supporting worksheets you've moved to different folders.

You should redirect links whenever you:

- Rename a supporting document without the dependent worksheet being open.
- Move a dependent or supporting worksheet to another folder without opening the linked worksheets and saving first the supporting worksheets and then the dependent worksheet with the File Save As command.

NOTE If you moved a dependent worksheet and the links are only to documents in other folders, rather than to documents in the same folder or one of its subfolders, you don't need to redirect links.

Redirecting links for supporting documents

To do this procedure, you must be using full menus.

1 Activate the dependent worksheet.

2 Choose File Links.

3 In the Link Type box, select the type of links you want to display.

In the Links box, Microsoft Excel displays a list of all the supporting documents for the active dependent worksheet with the type of link selected in the Link Type box.

4 In the Links box, select the supporting documents for which you want to redirect links.

   To select several documents at one time, hold down SHIFT and drag through the names of the documents. To select only some of the documents listed in the Links box, hold down COMMAND and click the name of each document you want to add to the selection.

5 Choose the Change button.

   Microsoft Excel displays a dialog box for each document you selected.

6 In the list, select the name of the new supporting document.

7 Choose the Change button.

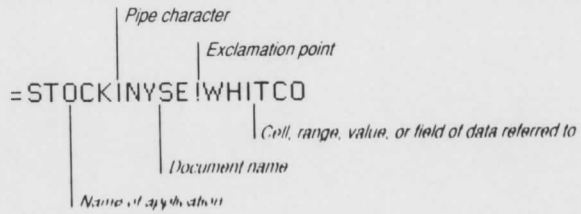
8 Repeat steps 6 and 7 for each document you selected.

Linking to Other Applications

Linking a Microsoft Excel worksheet to a document in another application is similar to linking Microsoft Excel worksheets. In the worksheet, you build a remote reference formula—similar to an external reference formula—which contains one or more remote references to cells, cell ranges, values, or fields of data in a document from the other application. Using these references, you can create a link between a Microsoft Excel document and a document in another application. Changes made to the document in the other application are immediately reflected in the Microsoft Excel document. You can also copy data from a Microsoft Excel document and paste it into a document in another application. Changes made to the Microsoft Excel document are immediately reflected in the document in the other application.

IMPORTANT To create a link between a Microsoft Excel worksheet or chart and a document in another application, you must be running both applications under system software version 7.0, and both applications must support dynamic data exchange (DDE).

The following illustration shows the parts of a remote reference formula:

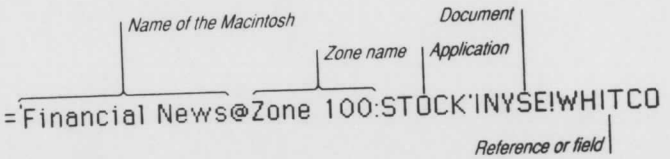


A remote reference formula must use this syntax:

- **Name of the other application** The application name must be immediately preceded by an equal sign and immediately followed by a pipe character (|). If the application name is not a valid Microsoft Excel name, enclose it in single quotation marks.
- **Name of the document (or topic) in the other application** This name must be immediately followed by an exclamation point (!). If it is not a valid Microsoft Excel name, enclose it in single quotation marks. In the preceding illustration, "NYSE" is the name of a document that contains New York Stock Exchange data. Some applications may not manage data as documents but as "topics" instead. For more information, see "Using Dynamic Data Exchange (DDE) in Command Macros," later in this chapter.

  For guidelines to follow when defining a name, see "Naming Cells and Formulas" in Chapter 6. For information on how a specific application manages data, see the documentation for that application.
- **Cell, range, value, or field of data referred to** In the preceding illustration, "WHITCO" specifies a field of data referred to by the formula. If the data resembles a cell reference, enclose it in single quotation marks (for example, =DATABASE|FILE1!'A1').

You can also link your worksheet to a program running on another Macintosh on the network by using the following syntax in the remote reference formula:



You can also link a chart you have created in Microsoft Excel to another application. This link ensures that whenever you change the chart in Microsoft Excel, your changes are automatically duplicated in the document in the other application. For example, you can paste a linked Microsoft Excel chart into a Microsoft Word document. Whenever you edit the chart or its supporting worksheet in Microsoft Excel, your changes are duplicated in the chart in the Microsoft Word document, if it is open. If the document is not open, the chart is updated the next time you open it.

To link to an application on another Macintosh, you need access privileges to that Macintosh. For information on access privileges, see your system software version 7.0 documentation.

NOTE To change the Microsoft Excel data that appears in other applications, you must start Microsoft Excel, activate the supporting document, make your changes, and then save the document. If the application containing the Microsoft Excel data supports dynamic data exchange (DDE) and lets you update links to documents from other applications, you can start the application and update the link for the dependent document to the Microsoft Excel document in which you made changes.

Creating a link between a supporting Microsoft Excel document and a dependent document in another application

Use this procedure when the Microsoft Excel worksheet or chart is the supporting document in the link you create between the worksheet or chart and a dependent document in another application. For example, you can paste link Microsoft Excel worksheet data or a chart into a Microsoft Word document.

1. Open the supporting worksheet or chart in Microsoft Excel and the dependent document in the other application.
2. Activate the supporting worksheet or chart in Microsoft Excel.
3. If you're in a worksheet, select the worksheet data you want to refer to from the other application.

   If you're in a chart, choose Chart Select Chart.
4. Choose Edit Copy.

   The marquee appears around the selected worksheet data or chart.
5. Activate the dependent document in the other application.
6. Position the insertion point where you want to insert the worksheet data or chart.
7. Follow the procedure for linking data in the other application.

   A link is created between the supporting and dependent documents. For example, if you're pasting a Microsoft Excel chart into a Microsoft Word document, you would choose Edit Paste Link in Microsoft Word.

If the Edit Paste Link command is unavailable, the other application does not support linking or cannot interpret the data format that Microsoft Excel provides. For information, see the documentation for that application.

Creating a link between a dependent Microsoft Excel worksheet and a supporting document from another application

Use this procedure when the Microsoft Excel worksheet is the dependent document in the link you create between a worksheet and another application. The other application provides the text or graphics you want to paste into Microsoft Excel.

1. Open the dependent worksheet in Microsoft Excel and the supporting document in the other application.
2. Activate the supporting document in the other application.

3. Follow the procedure in the other application for selecting and copying data.
4. Activate the dependent Microsoft Excel worksheet.
5. Select the cell or the upper-left corner of the range that will contain the remote reference.
6. To paste data into cells, choose Edit Paste Link in Microsoft Excel.

   To paste a picture of the data, hold down SHIFT and choose Edit Paste Picture Link. If the data is text, Microsoft Excel pastes the data as a linked picture of cells.

   Microsoft Excel creates a remote reference formula that links the documents. This formula appears in the formula bar.

If the Edit Paste Link command is unavailable, the other application does not support linking or cannot supply the data in a format that Microsoft Excel understands. For information, see the documentation for that application.

NOTE If a link to a remote data item is pasted into more than one cell, the Edit Paste Link command will enter it as an array. For more information on arrays, see "Creating and Using an Array Formula" in Chapter 7.

You can also create the link by typing the remote reference formula in the formula bar. When you establish a link by typing the formula, Microsoft Excel displays a message if the remote data to be linked is not accessible. For information, see "Updating a Worksheet Linked to Another Application," following in this section. For information on entering formulas, see "Entering a Formula" in Chapter 3.

Updating a Worksheet Linked to Another Application

When you open a worksheet containing remote references, Microsoft Excel displays a message asking if you want to reestablish links to the other application. Choosing OK reestablishes the links and updates the dependent references; choosing Cancel freezes the dependent references and uses the existing values. These links are called dynamic data exchange (DDE) links, which provide a way to exchange data between applications.

If the supporting application is not running or is not accessible when Microsoft Excel tries to reestablish a link, a message asks if you want to start the supporting application. If you choose OK, Microsoft Excel starts the application. If Microsoft Excel still cannot access the data after the application is started, the cells containing the linking formulas display error values.

If you want your formulas to use the last values saved instead of the error values, close the worksheet without saving changes, and then reopen it. However, if you do this, you will lose any other changes you have made to your worksheet.

Controlling the calculation of a DDE link

You can control whether DDE links are calculated whenever information changes or only when you want them calculated. Controlling the calculation of DDE links is useful for links to information that does not change very often or when you want to control when updating occurs. It is especially useful when you want to reduce the calculation time for a large worksheet.

To do this procedure, you must be using full menus.

NOTE You can also control the calculation of publish and subscribe links. For information, see the following section, "Creating Publishers and Subscribers."

1. Activate the dependent worksheet containing the remote references.
2. Choose File Links.
3. In the Link Type box, select DDE Links.

   In the Links box, Microsoft Excel displays a list of all supporting DDE links for the active dependent worksheet.
4. In the Links box, select the DDE links for which you want to control calculation.

   To select several DDE links at one time, hold down SHIFT and drag through the names of the DDE links you want to select. To select only some of the DDE links, hold down COMMAND and click the name of each DDE link you want to add to the selection.
5. Choose the Options button.
6. If you want DDE links updated automatically, turn on the Automatic check box.

   If you want to update DDE links manually, turn off the Automatic check box.
7. Choose OK.

Automatic DDE links are updated whenever information changes—Microsoft Excel calculates any formulas immediately after you make a change in the document. Manual links are calculated only when you perform the following procedure.

Updating a DDE link manually

Once you have turned off automatic calculation of a DDE link, you may need to update that link periodically to keep your worksheet accurate. For example, you would probably update manual links before printing your worksheet.

To do this procedure, you must be using full menus.

1. Activate the dependent worksheet containing the remote references.
2. Choose File Links.

3. In the Link Type box, select DDE Links.

   In the Links box, Microsoft Excel displays a list of all supporting DDE links for the active dependent worksheet.
4. In the Links box, select the DDE links you want to update.

   To select several DDE links at one time, hold down SHIFT and drag through the names of the DDE links you want to select. To select only some of the DDE links, hold down COMMAND and click the name of each DDE link you want to add to the selection.
5. Choose the Update button.

Turning off updating of all remote references

You might want to turn off updating of remote references and use the latest values rather than having the values updated on your worksheet. This can be useful to reduce worksheet calculation time when the values from the other document do not change.

NOTE This procedure affects only the active dependent worksheet.

1. Activate the dependent worksheet containing the remote references.
2. Choose Options Calculation.
3. Turn off the Update Remote References check box.
4. Choose OK.

Microsoft Excel uses the last values from the supporting documents for the remote references. When you want to reestablish links, choose the Options Calculation command and turn on the Update Remote References check box.

Turning off updating of a single remote reference

Use this procedure if you want to turn off updating of only one of the remote references on the active dependent worksheet.

To do this procedure, you must be using full menus.

NOTE This procedure affects only the active dependent worksheet.

1. Activate the dependent worksheet containing the remote reference.
2. Choose File Links.
3. In the Link Type box, select DDE links.

   In the Links box, Microsoft Excel displays a list of all supporting DDE links for the active dependent worksheet.
4. In the Links box, select the DDE link you want to turn off.
5. Choose the Options button.

6 Turn off the Automatic check box.

7 Choose OK.

Navigating Through Linked Data

You can quickly display the supporting data for any dependent reference on the active worksheet. The references can be local references, external references, or remote references.

NOTE If you double-click a cell that contains both a reference and a note, Microsoft Excel displays the Formula Note box. For information on using notes, see "Adding Comments to a Worksheet" in Chapter 6.

Navigating a link

1 Activate the dependent worksheet containing local, external, and remote references.

2 Double-click the cell containing a reference.

When the cell contains multiple references, Microsoft Excel uses the one that appears leftmost in the formula bar.

If the reference is to another cell on the same worksheet (local reference), Microsoft Excel displays the supporting data.

If the reference is to another worksheet (external reference), Microsoft Excel activates the other worksheet and displays the supporting data.

If the reference is to another application (remote reference), Microsoft Excel starts the other application, activates the document containing the supporting data, and displays the supporting data.

When you finish viewing the supporting data for a local or an external reference, you can quickly go back to where you were in the dependent worksheet by choosing the Formula Goto command. Each time you use the Formula Goto command to go to another part of the same worksheet or another worksheet, Microsoft Excel automatically displays your previous location in the Reference box the next time you choose the command.

Controlling Access to Microsoft Excel from Other Applications

Microsoft Excel can respond to dynamic data exchange (DDE) requests initiated by another application that supports system software version 7.0 and DDE. To respond to DDE requests from an application running on another Macintosh, you must have access privileges to that Macintosh. For information on access privileges, see your system software version 7.0 documentation.

While Microsoft Excel is running, it responds to any DDE requests from other applications, unless you disable remote requests.

Controlling remote requests

To do this procedure, you must be using full menus.

1 Choose Options Workspace.

2 To disable remote requests, turn on the Ignore Remote Requests check box.

To allow remote requests, turn off the Ignore Remote Requests check box.

3 Choose OK.

Removing Links Between Documents

You can remove links between worksheets in the same application or you can remove links to other applications in the following ways:

- If an external or remote reference comprises an entire formula, you can calculate the formula and change it to a value. This replaces the formula with its resulting constant value in the dependent worksheet. This is called "freezing" the value of an entire external or remote reference formula.
- If an external or remote reference is part of a larger formula, you can calculate only the reference to change it to a value and preserve the rest of the formula as a formula.
- If you no longer need the values from the supporting document in the dependent worksheet, you can delete the formula containing the external or remote reference entirely from the dependent worksheet. To do this, select the cell with the external or remote reference, press DELETE to delete it from the formula bar, and then click the enter box or press ENTER.

Freezing the value of an entire external or remote reference formula

Use this procedure to remove a link if the external or remote reference formula comprises an entire cell entry.

To do this procedure, you must be using full menus.

1 On the dependent worksheet, select the cell or cells containing external or remote references.

2 Choose Edit Copy.

3 Choose Edit Paste Special.

4 Under Paste, select the Values option.

5 Choose OK.

Freezing the external or remote reference portion of a larger formula

Use this procedure if you want to preserve the rest of the formula as a formula and not a value.

To do this procedure, you must be using full menus.

1. On the dependent worksheet, select the cell containing the external or remote reference.
2. In the formula bar, select the external or remote reference part of the formula.
3. Choose Options Calculate Now.
4. Click the enter box or press ENTER.

NOTE To make sure all links are deleted, scan the dependent worksheet by choosing the Formula Find command. Type an exclamation point (!) in the Find What box and select the Formulas option. When you choose OK, Microsoft Excel looks for any formula containing the ! character which indicates an external or remote reference. For more information, see "Finding and Replacing Cells and Data" in Chapter 4.

MORE ABOUT

More About Linking Documents

Guideline

Opening Supporting Documents as Read-Only By opening supporting documents as read-only, you can open more documents at the same time.

Tips

Using Names With Microsoft Excel, you can define names for cells and use those names in your formulas instead of actual cell references. Using names simplifies creating and checking formulas. For information on defining names, see "Naming Cells and Formulas" in Chapter 6.

Picking Up Where You Left Off If you want to keep your current arrangement of open windows so you can quickly restore it later, you can do so by saving your workspace with the File Save Workspace command. This command saves a list of the open document windows and their size and location in a workspace file. To restore your workspace so you can pick up where you left off, open the workspace file. For more information on saving and restoring a workspace, see "Setting Up a Workspace" in Chapter 16.

Saving a Worksheet That Contains Links to a Large External Document If a worksheet with several links to a large external document requires an unusually large amount of disk space, choose Options Calculation and turn off the Save External Link Values check box. This prevents Microsoft Excel from saving copies of the values contained in the external document along with your worksheet.

Creating Publishers and Subscribers

With Microsoft Excel and system software version 7.0, you can share data between documents in different applications. Use publishers and subscribers when you want to share data among several people or applications. To make part of a document available to other applications, you create a *publisher* for that portion of the document. When you create a publisher, an *edition* is created that contains the data you publish and is linked to the published data.

Other documents or applications can then share the data by creating a *subscriber* to the edition. Subscribing to an edition puts a copy of the edition into the document from which you subscribe. When you change the data in the publisher to which the edition is linked, the changes are reflected in the edition and all documents subscribing to the edition.

For example, to dynamically link a Microsoft Excel chart with a Microsoft Word document, you could publish the chart from Microsoft Excel, and then subscribe to the chart from within Word.

NOTE You can also use dynamic data exchange (DDE) to have applications running under system software version 7.0 communicate with each other. Using DDE, you can have macros send data and commands between Microsoft Excel and other applications. For more information about using Macintosh DDE, see "Using Dynamic Data Exchange (DDE) in Command Macros," later in this chapter.

Creating a Publisher with a Microsoft Excel Document

You create a publisher and its edition with the Edit Create Publisher command. When you publish part of a document as an edition, the data or graphics in the edition are linked to the publisher. Changes you make in the publisher are also made in the edition and in any documents that subscribe to the edition.

Creating a publisher from a worksheet

To do this procedure, you must be using full menus.

1. Select the range you want to publish.

   If the selection includes any part of an object, the portion of the object that overlaps the selection will also be published.

2. Choose Edit Create Publisher.

   The dialog box displays a preview of a portion of the selection to be published.

3 In the Name Of New Edition box, enter the name of the new edition.

4 Choose the Publish button to publish the data.

An edition is created that contains the information you published. You can subscribe to the edition to use the information in another document or application.

Creating a publisher from a chart

To do this procedure, you must be using full menus.

1 Select the chart you want to publish.

2 Choose Edit Create Publisher.

3 Enter the name of the new edition you want to assign to the chart.

4 To control the appearance and size of the published chart, choose the Options button.

To publish the chart and let Microsoft Excel control appearance and size, go to step 7.

5 To publish exactly what you see on the screen, select the As Shown On Screen options.

To publish what you would see if you printed the chart or picture, select the As Shown When Printed options.

6 Choose OK.

7 Choose the Publish button to publish the chart.

Creating a Subscriber in a Microsoft Excel Document

To subscribe to an edition, a worksheet or macro sheet must be the active document. You can subscribe to editions created by other documents or applications by using the Edit Subscribe To command. This puts a copy of an edition into your document at the active cell or selected object. If a range is selected and the range is too small to contain the edition data, Microsoft Excel fills the range with as much data as can be displayed.

When you select a subscriber, either by clicking a subscribed picture or by selecting a cell in a subscriber, the formula bar displays the following formula:

{SUBSCRIBER(*editionname*)}

Editionname is the full path of folders and disks to the edition. For example, {SUBSCRIBER("Harddisk:Word:Sales Report")} is in the formula bar when a subscriber named Sales Report in the folder Word on the hard disk named Harddisk is selected.

Subscribing to editions

To do this procedure, you must be using full menus.

1 Select the cell, object, or range where you want to place the subscriber.

2 Choose Edit Subscribe To.

3 In the list, select the edition you want to subscribe to.

A preview of a portion of the selected edition is displayed in the dialog box.

4 Choose the Subscribe button.

Microsoft Excel subscribes to the selected edition and places a copy of it in your worksheet.

NOTE If an edition contains both data and a picture, Microsoft Excel subscribes only to the data. You can include the picture portion of an edition by subscribing to the edition as a picture. To subscribe to an edition as a picture, hold down SHIFT while you choose the Subscribe button.

Updating or Canceling Publishers and Subscribers

In the Update Editions dialog box, you can get the most recent edition of a publisher or subscriber, choose to have them updated automatically or manually, or cancel publishers and subscribers.

To display a list of all publishers or subscribers in a document, you can choose the File Links command. In the File Links dialog box, you can then update or cancel a publisher or subscriber. You can also use the File Links dialog box to select or open a publisher.

Updating a publisher's edition

1 Double-click the publisher.

Microsoft Excel displays the Update Editions dialog box.

2 Choose the Send Edition Now button.

Updating a subscriber

1 Double-click the subscriber.

Microsoft Excel displays the Update Editions dialog box.

2 Choose the Get Edition Now button.

Controlling when a publisher's edition is updated

1 Double-click the publisher.

Microsoft Excel displays the Update Editions dialog box.

2 To have the edition updated automatically each time the document is saved, select the On Save option under Send Editions.

To have the edition updated only when you send a new edition, select the Manually option under Send Editions.

3 Choose OK.

Controlling when a subscriber is updated

1 Double-click the subscriber.

Microsoft Excel displays the Update Editions dialog box.

2 To have the subscriber updated automatically whenever its edition is updated, select the Automatically option under Get Editions.

To have the subscriber updated only when you choose to get a new edition, select the Manually option under Get Editions.

3 Choose OK.

Opening a subscriber's publisher

1 Double-click the subscriber.

Microsoft Excel displays the Update Editions dialog box.

2 Choose the Open Publisher button.

Microsoft Excel opens the document containing the subscriber's publisher.

Canceling a subscriber or publisher

1 Double-click the publisher or subscriber.

2 If you double-clicked a publisher, choose the Cancel Publisher button.

If you double-clicked a subscriber, choose the Cancel Subscriber button.

Using the File Links command with publishers and subscribers

1 Choose File Links.

2 In the Link Type box, select Publishers or Subscribers.

Microsoft Excel displays a list of the publishers or subscribers contained in the document.

3 In the list, select the publisher or subscriber you want.

4 To update the publisher's edition or the subscriber, choose the Update button.

To cancel the publisher or subscriber, or change its updating options, choose the Options button. Microsoft Excel displays the Update Editions dialog box. For information on using the options in this dialog box, see the preceding procedures.

If you selected a publisher in the list, you can select that publisher in the document by choosing the Select button.

If you selected a subscriber in the list, you can open the document that contains the subscriber's publisher by choosing the Open button.

Embedding Objects

You can *embed* Microsoft Excel data in a document created in another application. The data can be a cell, a cell range, a chart, an object, or an entire Microsoft Excel document. You can also embed data from another application, such as text, a table, a chart, or a drawn object, in Microsoft Excel. Data that you embed are called *embedded objects*.

IMPORTANT To embed a Microsoft Excel object in a document from another application, you must be running both applications under system software version 7.0, and both applications must support dynamic data exchange (DDE) and embedding.

You may want to use embedding instead of linking when you don't need a dynamic link between the two applications, but you want to be able to edit and format an object from within another application. For example, you can embed a Microsoft Excel chart as an object in a report created in another application. All the information that was used to create the object, in this case a chart, is *encapsulated* in the embedded object that appears in the report. While you're working in the report, you may decide that you want to edit the object; for example, change the chart type from a bar chart to a pie chart. To edit the object, you simply double-click the embedded object. This opens the object in the application in which it was created and lets you make the editing and formatting changes you want. When you return to the report, the embedded object is updated with the changes you made.

When transferring documents that contain embedded objects, you need to transfer only the document itself. The embedded object carries with it all the information used to create the object. However, the embedded object does not carry the application that was used to create it; the application used to create the embedded object must be accessible before you can make editing and formatting changes.

IMPORTANT Since the embedded object includes the information necessary to create the object, embedded objects can increase your file size. You can reduce your file size by converting an embedded object to a picture. Once this is done, you can no longer edit the picture as an embedded object. For information on editing the EMBED formula to convert an object to a picture, see the "Embedding from another application into Microsoft Excel" procedure in this section. For information on copying and pasting pictures without embedding them, see "Exchanging Graphics with Other Applications" in Chapter 14.

For information on	See
Creating an embedded chart on a Microsoft Excel worksheet	"Creating a New Chart" in Chapter 11
Editing and formatting an embedded chart	Chapter 12, "Editing a Chart," and Chapter 13, "Formatting a Chart"

Online Help also provides information on embedding objects. To display online Help, choose the Window Help command. If you are using system software version 7.0 and the Help command does not appear on the Window menu, display Help by pointing to the Help menu icon and choosing the Microsoft Excel Help command. For information on a specific command, select the Commands topic. For information on using online Help, see "Using Help" in Chapter 1.

Embedding from Microsoft Excel into another application

1. Open the Microsoft Excel document that contains the object you want to embed and the document in the other application in which you want the object embedded.
2. Activate the Microsoft Excel document.
3. Select the cell, cell range, chart, or entire worksheet you want to embed in the other document.
4. Choose Edit Copy.

   The marquee appears around the selection.
5. Activate the document in the other application.
6. Position the insertion point where you want to embed the cells, chart, or worksheet.
7. Follow the procedure in the other application for embedding an object.

   For example, choose Edit Paste or Edit Paste Special and edit the object type.

If the object is not embedded, the other application does not support embedding. For information, see the documentation for that application.

Embedding from another application into Microsoft Excel

1. Open the document that contains the object you want to embed in the other application and the Microsoft Excel document in which you want the object embedded.
2. Activate the document in the other application.
3. Follow the procedure for selecting and copying the object in the other application.
4. Activate the Microsoft Excel document.
5. Select either a cell or any graphic object that is located where you want to embed the new object.
6. If you selected a cell, hold down SHIFT and choose Edit Paste Picture.

   If you selected a graphic object, choose Edit Paste.

   When you select the embedded object, you will see an EMBED formula in the formula bar. To convert the embedded object to a picture, select the EMBED formula in the formula bar, and press DELETE. Once the object is converted to a picture, you can no longer edit it as an embedded object.

Opening an embedded object

▶ Double-click the embedded object.

The application you used to create the object starts and opens the object. You can edit the object just as you normally do in the original application.

Deleting an embedded object from Microsoft Excel

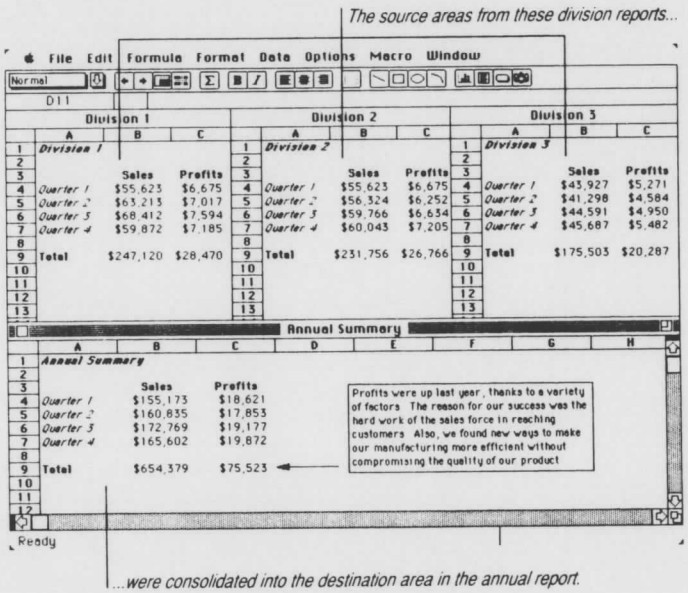
1. Select the embedded object.
2. Press DELETE.

Deleting an embedded Microsoft Excel object

▶ Follow the procedure in the other application for selecting and deleting an embedded object.

Consolidating Data from Multiple Worksheets

You can use *consolidation* to summarize large amounts of data. When you choose the Data Consolidate command, Microsoft Excel consolidates the source ranges you specify. The following illustration shows how the totals from three quarterly reports can be added using consolidation:


The source areas from these division reports...
File Edit Formula Format Data Options Macro Window
Normal
D11
Division 1
Division 1
Sales Profits
Quarter 1 $55,623 $6,675
Quarter 2 $63,213 $7,017
Quarter 3 $68,412 $7,594
Quarter 4 $59,872 $7,185
Total $247,120 $28,470
Division 2
Division 2
Sales Profits
Quarter 1 $55,623 $6,675
Quarter 2 $56,324 $6,252
Quarter 3 $59,766 $6,634
Quarter 4 $60,043 $7,205
Total $231,756 $26,766
Division 3
Division 3
Sales Profits
Quarter 1 $43,927 $5,271
Quarter 2 $41,298 $4,584
Quarter 3 $44,591 $4,950
Quarter 4 $45,687 $5,482
Total $175,503 $20,287
Annual Summary
Annual Summary
Sales Profits
Quarter 1 $155,173 $18,621
Quarter 2 $160,835 $17,853
Quarter 3 $172,769 $19,177
Quarter 4 $165,602 $19,872
Total $654,379 $75,523
Profits were up last year, thanks to a variety of factors. The reason for our success was the hard work of the sales force in reaching customers. Also, we found new ways to make our manufacturing more efficient without compromising the quality of our product.
Ready
...were consolidated into the destination area in the annual report.

For information on	See
Outlining a worksheet	"Outlining a Worksheet" in Chapter 6
Linking worksheets	"Linking Documents" earlier in this chapter
Group editing	"Editing Worksheets as a Group" earlier in this chapter

Online Help also provides information on consolidating data from multiple worksheets. To display online Help, choose the Window Help command. If you are using system software version 7.0 and the Help command does not appear on the Window menu, display Help by pointing to the Help menu icon and choosing the Microsoft Excel Help command. For information on a specific command, select the Commands topic. For information on using online Help, see "Using Help" in Chapter 1.

Using Consolidation

To consolidate data, you specify the range that will hold the consolidated information (the destination area) and the ranges on other worksheets from which you want to consolidate information (the source areas). You can consolidate data based on its position or category, specify which worksheet function to use to consolidate the data, and create links between worksheets when you consolidate. Microsoft Excel consolidates similar positions or categories of data using the worksheet function you specify.

- **Destination area** The destination area is the range on a worksheet where Microsoft Excel places the consolidated data. You can specify the destination area by selecting cells before you consolidate data. Microsoft Excel does not replace formats (except number formats) or formulas in the destination area.

Destination area selected	Result
Single cell	Microsoft Excel expands the destination area down and to the right to accommodate all the categories from the source areas.
Single row	Microsoft Excel expands the destination area down to accommodate all the row categories from the source areas. Microsoft Excel consolidates only as many column categories as there are columns in your initial selection.
Single column	Microsoft Excel expands the destination area to the right to accommodate all the column categories from the source areas. Microsoft Excel consolidates only as many row categories as there are rows in your initial selection.
Range of cells	Microsoft Excel consolidates only as many categories as will fit. If the destination area is not large enough to hold all the consolidated information, Microsoft Excel displays a message during consolidation.

- **Source areas** You can specify up to 255 source areas for Microsoft Excel to consolidate. The worksheets containing the source areas do not have to be open during consolidation, but they must have been saved. You can type the source reference into the Reference box in the Data Consolidate dialog box, or you can select the source area with the mouse or keyboard. If the worksheet containing the source areas is not open and you type the reference, be sure to include the complete path.

  You can also have Microsoft Excel create links from the destination area to each source area. Once the links are created, your consolidated data is updated whenever your source data changes.

- **Consolidating with functions** You can use 11 worksheet functions for consolidation:

AVERAGE	STDEV
COUNT	STDEVP
COUNTA	SUM
MAX	VAR
MIN	VARP
PRODUCT	

  Microsoft Excel uses SUM as the default function. For more information, see the *Microsoft Excel Function Reference*.

Consolidating by category of data

Consolidate data by category when you are consolidating from source areas containing similar data in different locations. For example, consolidate data by category if sales figures for a particular item are in the first column in one source area, the third column in the second source area, and the fourth column in the last source area. If you are consolidating monthly expense reports by category and have the Top Row check box turned on, all the columns labeled "January" are consolidated even though the January column is not in the same location in each source area. When consolidating by category, Microsoft Excel moves the totals to the bottom of the categories, no matter where they appear in the source areas.

To do this procedure, you must be using full menus.

1. Select the destination area to contain the consolidated data, including the category titles you want to use.
2. Choose Data Consolidate.
3. Select the first source area, including the category titles you want to use.

   You can also type references to cells on worksheets that are not open.
4. Choose the Add button.
5. Repeat steps 3 and 4 for all the source areas you want to consolidate.
6. If the category titles are in the top row of the source areas, turn on the Top Row check box.

   If the category titles are in the left column of the source areas, turn on the Left Column check box.

   You can turn on both check boxes for a single consolidation. If only one of the check boxes is turned on, Microsoft Excel consolidates by category for the check box that is turned on and by position for the check box that is turned off.
7. In the Function box, select the function you want Microsoft Excel to use to consolidate the data. The SUM function is the default.
8. Choose OK.

Microsoft Excel consolidates the data from the source areas into the destination area. You can reverse the consolidation by choosing the Edit Undo command immediately after you consolidate.

Consolidating by position of data

Consolidate data by position when you are consolidating worksheets created from the same template with source areas in the same locations. Similar categories of data must occupy exactly the same location in each source area. For example, you can consolidate data by position if you are consolidating from a monthly budget template given to all managers in your organization.

To do this procedure, you must be using full menus.

1. Select the destination area to contain the consolidated data.
2. Choose Data Consolidate.
3. Select the first source area.

   You can also type references to cells on worksheets that are not open.
4. Choose the Add button.
5. Repeat steps 3 and 4 for all the source areas you want to consolidate.
6. Select the function you want Microsoft Excel to use to consolidate the data. The SUM function is the default.
7. Choose OK.

Microsoft Excel consolidates the data from the source areas into the destination area. You can reverse the consolidation by choosing the Edit Undo command immediately after you consolidate.

Creating links to source data

When you consolidate data, you can create links to the source data used in the consolidation. Once you have created these links, your destination area is automatically updated if your source data changes. Microsoft Excel creates a linking formula for every cell and inserts rows or columns in your destination area to hold the linking formulas. The destination area is then outlined, with the linking formulas placed in rows or columns subordinate to the positions or categories in the destination area. Be sure that the rows or columns added to your destination area will not disrupt other parts of your worksheet.

To do this procedure, you must be using full menus.

1. Set up your source and destination areas for consolidation by position or category.
2. Choose Data Consolidate.
3. Turn on the Create Links To Source Data check box.
4. Choose OK.

Microsoft Excel consolidates the data from the source areas. Then it outlines the destination area, adding rows and columns as necessary to contain linking formulas to the source data.

Editing the reference to a source area

You can edit the reference to a source area in an existing consolidation. Editing references helps you to maintain a consolidation when source data is moved. You can also edit existing source area references to add new references to a consolidation.

To do this procedure, you must be using full menus.

1. Choose Data Consolidate.
2. In the All References box, select the source area you want to edit.
3. In the Reference box, edit the reference.
4. Choose the Add button.
5. If you don't want to keep the old reference, select it in the All References box and choose the Delete button.
6. To reconsolidate using the new source area, choose OK.

   To close the dialog box, choose the Close button.

Adding a source area

You can add a source area to an existing consolidation.

To do this procedure, you must be using full menus.

1. Choose Data Consolidate.
2. Select the source area in an open worksheet or type its reference in the Reference box.
3. Choose the Add button.
4. To reconsolidate using the new source area, choose OK.

   To close the dialog box, choose the Close button.

Deleting a source area

You can delete a source area from an existing consolidation.

To do this procedure, you must be using full menus.

1. Choose Data Consolidate.
2. In the All References box, select the source area you want to delete.
3. Choose the Delete button.
4. To reconsolidate without the deleted source area, choose OK.

   To close the dialog box, choose the Close button.

MORE ABOUT

More About Consolidating Data from Multiple Worksheets

Guidelines

Only Values Are Consolidated Text and formulas are not consolidated.

Consolidating from Lotus 1-2-3 Worksheets You can consolidate worksheets saved in any of the 1-2-3 file formats supported by Microsoft Excel. For a list of these file formats, see "Exchanging Documents with Other Applications," later in this chapter. The worksheets don't have to be open during consolidation. You can also create links to 1-2-3 worksheets during consolidation.

Using Names in Consolidation You can type names in the source area references in the Reference box. Using names instead of references ensures that the right data is consolidated, no matter where it is on the source worksheet.

If a worksheet has a range named Consolidate_Area, Microsoft Excel uses that range as the destination area for any consolidation on that worksheet.

You can use category titles in the destination area to control which categories are consolidated. If you place category titles in the top row or left column of the destination area, Microsoft Excel consolidates only those categories from the source areas. You can use the asterisk (*) and question mark (?) as wildcard characters in the destination categories. For example, categories titled Salaries and Salary would be consolidated into a category titled Salar* in the destination area.

Using Wildcard Characters in Consolidation You can use the asterisk (*) and question mark (?) as wildcard characters in the filename part of the source reference. For example, you could create a group of sales worksheets whose titles all start with Sales. Each sheet has a summary area named Results. You could consolidate from the same range on all the worksheets in the group by specifying the source area Sales*!Results. Microsoft Excel displays a message if the source reference is not a valid name or if it cannot find a reference during consolidation.

MORE ABOUT

Tips

Consolidating with Command Macros Try using command macros to do frequent consolidations. Macros make your work faster and more accurate. For information on recording a macro, see Chapter 18, "Automating Tasks with Command Macros."

Use Consolidation by Category Consolidate data by category whenever possible. Consolidation by category is more accurate than consolidation by position. Consolidation by position is intended only for a series of identical worksheets, such as worksheets created from the same template.

Creating Links During Consolidation to an Outlined Worksheet If the worksheet containing your destination area also contains an outline, do not turn on the Create Links To Source Data check box. Turning on this check box adds outlined rows and columns to your worksheet. If your worksheet already contains an outline, all the rows and columns between the destination area and the existing outline area are added to the outline.

Consolidating Within a Single Worksheet You can use consolidation to combine data from various areas on a single worksheet. Just specify source and destination areas on the same worksheet. Consolidation works well as a summary tool for large, single worksheets.

Automating Reporting with Consolidation and Mail You can combine consolidation with a macro that sends mail to automate your organization's reporting. For information on the CONSOLIDATE and SEND.MAIL functions, see the *Microsoft Excel Function Reference*.

Troubleshooting

Incorrect Results from Consolidation If consolidation did not produce the results you expected, be sure that you:

- Specified the function you want Microsoft Excel to use in consolidating the data.
- Turned on the Top Row or Left Column check box if you are consolidating by category.
- Included the row or column titles in your source and destination areas if you are consolidating by category.
- Specified a destination area large enough to hold the consolidated data.

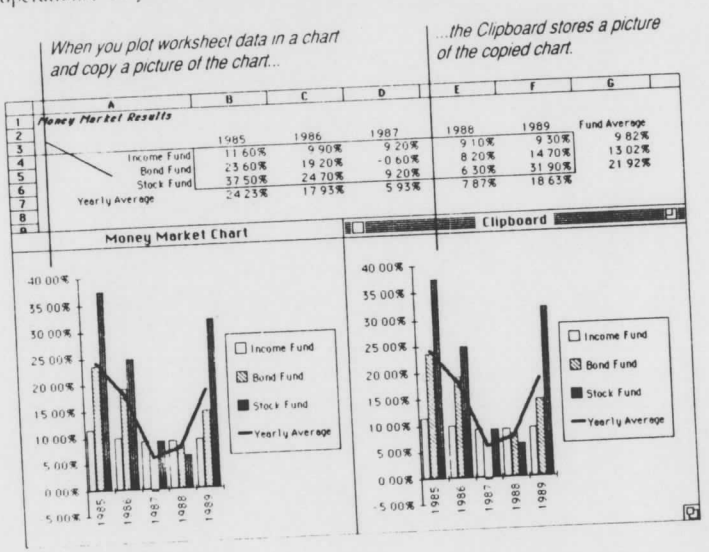
Exchanging Data Using the Clipboard

With the Clipboard, you can copy data, charts, or objects from Microsoft Excel to another application. You can also paste data into your Microsoft Excel worksheets from documents created with a word processor, such as Microsoft Word; from presentations created with Microsoft® PowerPoint®; or from documents created with other Macintosh applications.

When you cut or copy data, Microsoft Excel temporarily stores the data on the Clipboard. Then, you can paste it into another location within the same document, into another document created with the same application, or into a document created with another application. For more information on Clipboard operations, see your Macintosh documentation.

When you plot worksheet data in a chart and copy a picture of the chart...

...the Clipboard stores a picture of the copied chart.


Money Market Results
1985 1986 1987 1988 1989 Fund Average
Income Fund 11.60% 9.90% 9.20% 9.10% 9.30% 9.82%
Bond Fund 23.60% 19.20% -0.60% 8.20% 14.70% 13.02%
Stock Fund 37.50% 24.70% 9.20% 6.30% 31.90% 21.92%
Yearly Average 24.23% 17.93% 5.93% 7.87% 18.63%
Money Market Chart
Clipboard
Income Fund
Bond Fund
Stock Fund
Yearly Average

For information on	See
Cutting and pasting data	"Moving and Copying Data and Formats" in Chapter 4
Copying a linked chart to another application	"Linking Documents" earlier in this chapter

Online Help also provides information on exchanging data using the Clipboard. To display online Help, choose the Window Help command. If you are using system software version 7.0 and the Help command does not appear on the Window menu, display Help by pointing to the Help menu icon and choosing the Microsoft Excel Help command. For information on a specific command, select the Commands topic. For information on using online Help, see "Using Help" in Chapter 1.

Copying data from Microsoft Excel

1. Activate the Microsoft Excel document window containing what you want to copy.
2. Select the cells or objects you want to copy.
3. Choose Edit Copy.

   If you want to copy a picture of a chart or range, choose Edit Copy Picture by holding down SHIFT while selecting the Edit menu.
4. Activate the window or application you want to copy to.
5. Paste the information, using the procedure for pasting data in the application you are copying to.

NOTE If you use the Edit Cut command to copy an object to another application, the object is deleted from the worksheet you copied it from.

Copying data to Microsoft Excel

You can use the Clipboard to copy information from other applications into Microsoft Excel. This way, you can easily import data into Microsoft Excel for analysis or charting.

1. Activate the document containing what you want to copy.
2. Cut or copy the data, using the procedure for cutting or copying in the application you are copying from.
3. Activate the Microsoft Excel document you want to copy to.
4. Select the cells to paste the data in.
5. Choose Edit Paste.

   To paste a picture of the data, hold down SHIFT and choose Edit Paste Picture.

If an object is selected when you paste text from another application into Microsoft Excel, the text is placed in a text box. If you copy a table from a text-based program (such as a word processor or database application), you can arrange the imported data into columns and rows by using the Data Parse command. For information on parsing data into columns and rows, see "Parsing Imported Values," later in this chapter.

Displaying the contents of the Clipboard

To save time when you move data between documents, the Clipboard does not display the actual cells when you cut or copy data. Instead, it displays something like "Copy 2R x 3C" or "Cut 4R x 2C." When you paste the cells into another application, the cells you selected are pasted.

▶ Choose Window Show Clipboard.

MORE ABOUT

More About Exchanging Data Using the Clipboard

Guideline

Clipboard Formats Microsoft Excel supports the following Clipboard formats:

Format	Clipboard type identifier
Microsoft Excel file format	BIFF, BIFF3
Text	Display Text, OEM Text
Text (tab delimited)	Text
Formatted text	Rich Text Format*
Comma-separated values	CSV
Symbolic link format	SYLK
Lotus 1-2-3 Release 2.0 format	WK1
Data interchange format	DIF
Embedded object	Native OwnerLink, Picture, or other presentation format
Linked object	OwnerLink, ObjectLink, Link, Picture, or other presentation format
Values	Value for the Macintosh
Standard graphics format	CGM for Microsoft Excel for Windows or OS/2
Picture	PICT for the Macintosh; Picture* for Microsoft Excel for Windows or OS/2
Bitmap	Bitmap for Microsoft Excel for Windows or OS/2

*From Microsoft Excel only

Exchanging Documents with Other Applications

There are several ways to exchange data between Microsoft Excel and other applications. One way is to open documents from other applications directly into Microsoft Excel. Microsoft Excel automatically recognizes the file formats of many other spreadsheet and database applications. Also, you can save your Microsoft Excel documents in many common formats, and use them with other applications. Microsoft Excel opens and saves files in the following formats:

Format	Type of document
CSV	Comma-separated values
DBF 2	dBase II
DBF 3	dBase III
DBF 4	dBase IV
DIF	Data interchange format (VisiCalc)
Normal	Standard Microsoft Excel format
SYLK	Symbolic link (Microsoft Multiplan)
Text	ANSI text for Windows, ASCII text for OS/2, text for Macintosh
WK1	Lotus 1-2-3 Release 2
WKS	Lotus 1-2-3 Release 1 and Lotus Symphony
WK3	Lotus 1-2-3 Release 3
Excel 2.*x*	Microsoft Excel version 2.*x*

For information on	See
Opening and saving files	Chapter 3, "Creating and Using a Worksheet"
Linking documents	"Linking Documents" earlier in this chapter

Online Help also provides information on exchanging documents with other applications. To display online Help, choose the Window Help command. If you are using system software version 7.0 and the Help command does not appear on the Window menu, display Help by pointing to the Help menu icon and choosing the Microsoft Excel Help command. For information on a specific command, select the Commands topic. For information on using online Help, see "Using Help" in Chapter 1.

Opening documents from other applications in Microsoft Excel

You can open documents from other applications in Microsoft Excel and work with the data using the analysis, charting, formatting, and printing capabilities of Microsoft Excel.

1. Choose File Open.
2. In the list, select the document you want to open.
3. Choose the Open button.

Using Microsoft Excel documents in other applications

You can save Microsoft Excel documents in other file formats. This way, you can work with Microsoft Excel data in other applications or share Microsoft Excel data with people who use other applications.

1. Choose File Save As.
2. Choose the Options button.
3. In the File Format box, select the file format you want.
4. Choose OK.
5. In the Save Worksheet As box, type a new name for the document.
6. Choose the Save button.

Opening text files from other applications

You can open text files from other applications in Microsoft Excel. This can be useful for opening database files. Each line in a text file represents one row. Within a row, cells are delimited by a comma or a tab.

1. Choose File Open.
2. Choose the Text button.
3. Under Column Delimiter, select the character used to divide columns of data (comma or tab).
4. Under File Origin, select the operating environment the file came from: Macintosh, Windows, OS/2, or DOS.
5. Choose OK.
6. In the list, select the name of the file you want to open.
7. Choose the Open button.

Saving text files for use in other applications

You can save Microsoft Excel documents as text files for use in other applications. Microsoft Excel can delimit cells in a text file with a tab or a comma. Text files that use commas to delimit cells are stored in a file format called CSV (comma-separated values).

1. Choose File Save As.
2. In the Save Worksheet As box, type a name for the document.
3. Choose the Options button.
4. In the File Format box, select the text file format you want—Text, CSV, Text (Windows), CSV (Windows), Text (OS/2 or DOS), or CSV (OS/2 or DOS).
5. Choose OK.
6. Choose the Save button.

Parsing imported values

If you copy data into Microsoft Excel from another application, especially a database application, several columns of data may be condensed into a single column. For example, if you open a database report file from another application as a worksheet in Microsoft Excel, each full record is typically placed in a single cell. Use the Data Parse command to separate the fields of each record into separate columns. The range you parse can be any number of rows long, but only one column wide. The parse settings you create for the first cell in the range apply to all cells in the range.

To do this procedure, you must be using full menus.

IMPORTANT When you parse the data, Microsoft Excel fills cells to the right of the column you are parsing. If there is data in those cells, that data is replaced by the parsed data. Make sure there are enough blank cells to the right of the range you are parsing to accommodate the data.

1. Select the range of cells containing the data you want to separate. The range must be only one column wide.
2. Choose Data Parse.

   The Data Parse dialog box displays the contents of the first cell in the range. The parse settings you set for the first cell apply to all cells in the range.
3. Choose the Guess button.

   Microsoft Excel adds brackets to the parse line. Each set of brackets shows where a field will be separated into a different column.
4. If necessary, change the guess by adding or deleting brackets in the parse line.

   You add or delete brackets in the Guess line just as you edit any other text box in a dialog box.
5. Choose OK.

If you need to parse dissimilar cells, see the PARSE function in the *Microsoft Excel Function Reference* for a macro that parses based on a delimiting character.

Using Dynamic Data Exchange (DDE) in Command Macros

There are several ways to exchange data between Microsoft Excel documents and documents created in other applications. One way is by using dynamic data exchange (DDE), which is a method of exchanging data between applications. You can use DDE in command macros to:

- Start another application.
- Send data to another application.
- Get data from another application.
- Carry out commands in another application.

IMPORTANT To use DDE, you must be using system software version 7.0.

For information on	See
Writing command macros	Chapter 19, "Designing and Writing a Command Macro"

Using DDE

Command macros using DDE must perform these steps:

- Open a channel. The macro must first open a channel to the application with which it is exchanging data. Use the INITIATE function to open a channel between applications.
- Send or request data. Once a channel is open between applications, data can be exchanged. Use the REQUEST function to request data from another application; use the POKE function to send data to another application.
- Close a channel. After the macro has exchanged data, use the TERMINATE function to close the channel between the applications.

The following illustration shows two command macros using DDE. The first one requests available DDE topics from a word processor that supports DDE; the second one sends text from a cell to the beginning of a document.

	A	B	C
1			
2		**Topics**	
3	topic_channel	=INITIATE("Editor","system")	open a channel to system
4	results	=SET.NAME("results",REQUEST(topic_channel,"topics"))	request available topics
5		=TERMINATE(topic_channel)	close channel
6		=RETURN()	end macro
7			
8			
9		**Send_data**	
10	send_channel	=INITIATE("Editor","hard disk editor test")	open a channel to document
11		=POKE(send_channel,"StartOfDoc",C11)	send this comment to document
12		=TERMINATE(send_channel)	close channel to document
13		=RETURN()	end macro

All applications using DDE to exchange data must include three elements: the name of the application (app), the basic data grouping (topic), and the data within a topic (item).

When you access Microsoft Excel from another application, you may need to know which values Microsoft Excel recognizes for app, topic, and item:

Category	Value recognized by Microsoft Excel
App_text	The text value "Excel".
Topic_text	Either System or the name of any open document, just as it appears in the title bar, as text. For example, "Sales Report".
Item_text	Any reference or name that is recognized as the name of a reference. If you are using the System topic, Microsoft Excel recognizes some special items. These items are described in the rest of this section.

Opening a DDE Channel

Use the INITIATE function to open a channel to a topic in a particular application. The topic can be a document open in the application or the application itself. To open a channel to a document, use the INITIATE function with the following syntax:

=INITIATE(*app_text*,*topic_text*)

Be sure to include the path for the document if it is not open or not in the current folder. For example, to open a channel to a document named Report in a word processor that supports DDE, use the following function:

=INITIATE("Editor","Report")

To open a channel to an application, use the name of the application along with the System topic:

=INITIATE(*app_text*,"System")

For example, to open a channel to the word processor, use the following function:

=INITIATE("Editor","System")

If the INITIATE function successfully opens a channel to the application, it returns the number of the channel.

Requesting Information

Once you have opened a channel to an application using the System topic, you can request information from the application using the REQUEST function. Applications that support DDE can provide different groups of information. To find out which groups of information an application provides, use the SysItems item.

To ask Microsoft Excel for specific information, use the following items along with the System topic:

Item	Information returned
SysItems	A list of all the items you can use with the System topic (that is, "SysItems", "Topics", "Status", and so on)
Topics	A list of all open documents, including their full pathnames
Status	"Ready" if Microsoft Excel is ready to carry out commands; "Busy" otherwise
Formats	A list of all Clipboard formats supported by Microsoft Excel
Selection	A list of the external references of all selected ranges in Microsoft Excel. References are given in absolute R1C1 style.

All values are returned by Microsoft Excel as an array of items in CF_TEXT (ASCII text) format. You must enter the REQUEST function as an array, or define a name for the result of the REQUEST function using the following syntax:

=SET.NAME(*name_text*, REQUEST(*channel_num*, *item_text*))

You can then use the INDEX function and the name of the array to locate various items in the named array.

Sending Data to an Application

Once you have opened a channel to a topic in another application, you can send data to that topic using the POKE function. The POKE function has the following syntax:

=POKE(*channel_num*,*item_text*,*data_ref*)

The item depends on the application you're sending information to. For information on locations to send information to, see the documentation for that application.

Carrying out commands in Microsoft Excel using DDE

You can have other applications instruct Microsoft Excel to perform a particular command.

1 For *app_text*, type **"excel"**

To specify a particular instance of Microsoft Excel, type **"excel"** plus a task identification number.

2 For *topic_text*, type **"system"**

3 For *item_text*, type a text value consisting of Microsoft Excel command-equivalent macro functions, with each function enclosed in brackets.

For example, the following item instructs Microsoft Excel to open the file Hard Disk:Excel:Survey:

"[OPEN(""Hard Disk:Excel:Survey"")]"

The macro functions used in the item must be command-equivalent macro functions, and any arguments to the functions must be constants. If you use a reference as an argument, give it as text in the R1C1 reference style. To use more than one function, concatenate the functions. For example, the item "[RUN("R1C1")][BEEP()]" instructs Microsoft Excel to run the macro starting in cell R1C1 and then beep. For information on command-equivalent macro functions, see the *Microsoft Excel Function Reference*.

Closing a DDE Channel

When you are finished using DDE to request information from or send information to another application, you must close the channel to that application using the TERMINATE function. The TERMINATE function has the following syntax:

=TERMINATE(*channel_num*)

MORE ABOUT

More About Using Dynamic Data Exchange (DDE) in Command Macros

Tip

Sending Keystrokes to Other Applications You can send keystrokes to other applications using the SEND.KEYS function. By sending keystrokes, you can carry out commands in other applications. For more information, see the SEND.KEYS function in the *Microsoft Excel Function Reference*.

Transferring Files with Microsoft Mail

You can use Microsoft Mail to send Microsoft Excel documents to other Microsoft Mail users. You can enclose a single worksheet, chart, or macro sheet in a message and send it to a range of recipients that you specify. You can also send several worksheets and macro sheets at one time by first defining them as a workgroup. You can't include a chart in a workgroup.

While you are working in Microsoft Excel, you can open documents sent to you through Microsoft Mail. These documents can be in any format that Microsoft Excel can open. For a list of the file formats that Microsoft Excel can open, see "Exchanging Documents with Other Applications," earlier in this chapter.

You can use Microsoft Mail with Microsoft Excel only if your computer is connected to a Microsoft Mail server and you are signed in to your mailbox. This section assumes that you know how to use Microsoft Mail to read and send messages. For details on installing, signing in to, and using the mail system, see your Microsoft Mail documentation.

NOTE To use Microsoft Mail with Microsoft Excel, you must be using Microsoft Mail version 2.0 or later.

Opening Mail

You use the File Open Mail command in Microsoft Excel to start Microsoft Mail and view the Microsoft Excel documents sent to you by other users. The File Open Mail command lists only those messages that contain documents in formats that Microsoft Excel can open. A message contains comments and documents.

Opening mail messages

1 Choose File Open Mail.

2 Select the name of the message you want to open.

To select multiple messages, hold down SHIFT while clicking or dragging through message names.

3 To open just the comment attached to the Microsoft Excel document, choose the Comments button.

To open both the comment and the document, choose the Open button. Microsoft Excel opens each document attached to the selected messages and displays the comments for each message in a separate window.

If you decide not to open any enclosed documents, choose the Cancel button.

Sending Mail

You can send any Microsoft Excel document through Microsoft Mail. You can create and format your document as you normally would within Microsoft Excel and then send it to other Microsoft Mail users. All the settings and formats of each Microsoft Excel document are sent along with the document.

You can also send worksheets and macro sheets together by first defining them as a workgroup. For example, if you want to include the worksheet that contains the data used in a macro sheet you created, you can send both the worksheet and the macro sheet as a workgroup in one message. You must send a Microsoft Excel chart in a separate message.

Sending a Microsoft Excel document

1 In Microsoft Excel, open the document you want to send.

You can send a worksheet, a chart, or a macro sheet.

2 Choose File Send Mail.

Microsoft Mail starts and the Send Document dialog box appears. Microsoft Excel specifies the active document as the document to send with the mail message and inserts the name of the active document in the subject line of the message.

3 Specify the users you want to receive your message.

4 Change the subject line, if you want.

5 Type your comments in the Comments box.

6 To send your message, choose the Send button.

To delete your message without sending it, choose Cancel. Deleting the message does not affect the document.

Sending a workgroup

You can use the File Send Mail command to send all the sheets in a workgroup at one time. Your comments are included with each worksheet and macro sheet in the workgroup.

NOTE If you are using Microsoft Mail version 2.0, each sheet in the workgroup is sent as a message with a copy of your comments. If you are using Microsoft Mail version 3.0 or later, one message is sent which includes all the sheets in the workgroup and only one copy of the comments.

1 Open the worksheets and macro sheets you want to send.

2 Choose Window Workgroup.

Microsoft Excel displays a list of all open, nonhidden worksheets and macro sheets in the Select Workgroup box.

3 In the Select Workgroup box, select the names of the sheets you want to include in the workgroup.

To select several sheets at one time, hold down SHIFT and drag through the names of the sheets you want to include in the workgroup. To select only some of the sheets listed in the Select Workgroup box, hold down COMMAND and click the name of each sheet you want to include in the workgroup.

4 Choose OK.

Microsoft Excel adds "[Workgroup]" to the names of the worksheets and macro sheets.

5 Choose File Send Mail.

Microsoft Mail starts and the Send Document dialog box appears. Microsoft Excel specifies the sheets in the workgroup as the documents to send with the mail message and inserts the name of the active sheet in the subject line of the message.

6 Specify the users you want to receive your message.

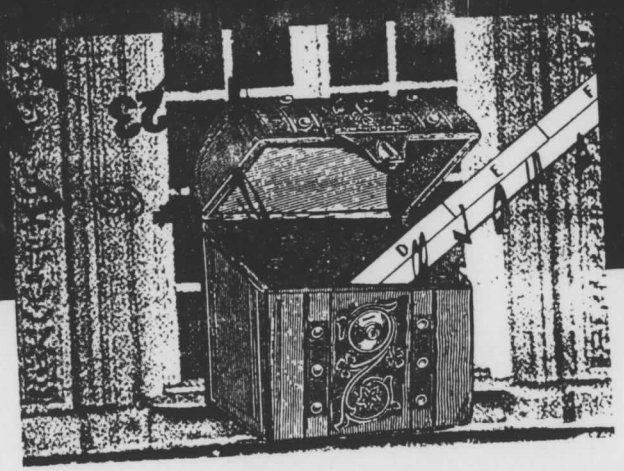
7 Change the subject line, if you want.

8 Type your comments in the Comments box.

9 To send your message, choose the Send button.

To delete your message without sending it, choose Cancel. Deleting the message does not affect the documents.

For more information on defining and editing a workgroup, see "Editing Worksheets as a Group," earlier in this chapter.



Databases

Part 3 Table of Contents

Chapter 9 Creating and Using a Database on a Worksheet ... 347

Designing an efficient database, entering database information, sorting information, and maintaining your information using a data form.

Chapter 10 Analyzing and Reporting Database Information ... 369

Finding, extracting, and deleting database information. Generating information about your database using Microsoft Excel's database functions.

Creating and Using a Database on a Worksheet

A *database* is a tool for organizing, managing, and retrieving information. You create a database on a worksheet and use it to store and manipulate large, complex bodies of data. By using the Microsoft Excel database capabilities, you can quickly enter, edit, locate, sort, and analyze your data. The Microsoft Excel data form makes it easy to view, change, add, find, and delete records in a database. You can also create a custom data form to display database information in the format you want.

Table of Contents

Creating a Database ... 347
Sorting a Database ... 352
Maintaining a Database with a Data Form ... 356
Creating a Custom Data Form ... 365

Creating a Database

In Microsoft Excel, you create a database on a worksheet. By using your worksheet data as a database, you can easily store and manipulate complex data or large amounts of data.

You can use a Microsoft Excel database to:

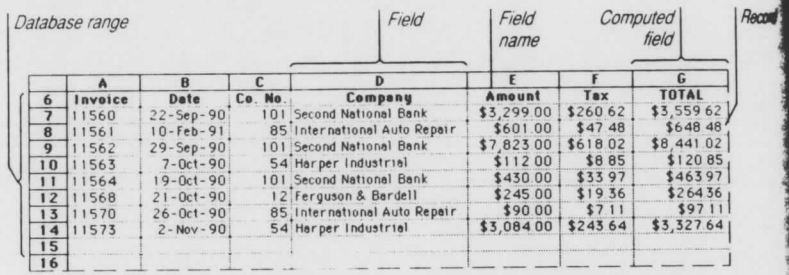
- Search or query to find specific data.
- Sort data alphabetically and numerically by rows or columns in ascending or descending order.
- Extract subsets of the data based on criteria you define.
- Perform statistical calculations on the data for analysis and decision-making.
- Print data organized for specific purposes.

For example, you might structure a database as a list of clients, their addresses, and their sales transactions. You could use the database to find all transactions during a certain period for one client and prepare a printout summarizing those transactions.

Online Help also provides information on creating a database. To display online Help, choose the Window Help command. If you are using system software version 7.0 and the Help command does not appear on the Window menu, display Help by pointing to the Help menu icon and choosing the Microsoft Excel Help command. For information on a specific command, select the Commands topic. For information on using online Help, see "Using Help" in Chapter 1.

The Parts of a Database

The following illustration shows the parts of a database:



	A	B	C	D	E	F	G
6	Invoice	Date	Co. No.	Company	Amount	Tax	TOTAL
7	11560	22-Sep-90	101	Second National Bank	$3,299.00	$260.62	$3,559.62
8	11561	10-Feb-91	85	International Auto Repair	$601.00	$47.48	$648.48
9	11562	29-Sep-90	101	Second National Bank	$7,823.00	$618.02	$8,441.02
10	11563	7-Oct-90	54	Harper Industrial	$112.00	$8.85	$120.85
11	11564	19-Oct-90	101	Second National Bank	$430.00	$33.97	$463.97
12	11568	21-Oct-90	12	Ferguson & Bardell	$245.00	$19.36	$264.36
13	11570	26-Oct-90	85	International Auto Repair	$90.00	$7.11	$97.11
14	11573	2-Nov-90	54	Harper Industrial	$3,084.00	$243.64	$3,327.64
15							
16							

- **Database range** A database range is a rectangular range of worksheet cells defined as a database; the first row of the database contains the field names. To define the database range, you use the Data Set Database command. Microsoft Excel assigns the name Database to this range and you can use the name as you would any other named reference. For example, you can use the name with the Formula Goto command to select the database range quickly. In the illustration, the range A6:G15 is the database range.
- **Record** A record is a single row in a database. Each record contains the same categories of data as every other record in the database. In the illustration, the data for International Auto Repair in row 8 is a record.
- **Field** Each column in a database is a separate field and each of the cells within a column is a field. You can enter text, numbers, dates, formulas, or functions as field entries. In the illustration, each record contains an Invoice field, a Date field, a Co. No. field, a Company field, an Amount field, a Tax field, and a TOTAL field.
- **Computed field** A field containing formulas or functions is called a computed field. In the illustration, the TOTAL field is a computed field.
- **Field name** A field name is a name that identifies the data stored in a field. The top row of a database must contain the field names; each column must have a field name. In the illustration, "Co. No." and "Company" are field names.

Planning a Database

Logical, consistent structure is the key to a powerful database. Before you begin creating your database, think about how you'll use it. With careful planning, you can create a database that helps you retrieve data quickly and uses your worksheet efficiently.

Use the following guidelines to help you organize your database:

- **Create fields** Create the fields from the categories of data you need to keep for each event or item. For example, in tracking sales orders, you might need to know the date; the client's name, address, and phone number; the quantity and price of each item ordered; and the order total. These would all become fields in the database. Use a separate field for each item you may want to retrieve separately. For example, if you want to sort addresses by postal code, create one field for addresses and a separate field for postal codes, rather than a single field containing both addresses and postal codes.
- **Create records** Create the records from the events or items you want to track. For example, if you have to track sales orders, make each sales order transaction a record in the database.
- **Test a model** Use a small model to test the design of your database. If you need to create a large database with many records, you might want to create the database with only 10 records and do a trial run with a few data retrieval techniques to see if the organization of the database suits your purposes.

Entering Database Information

After you decide on the design for your database, you can create the database by first entering the records according to the following guidelines. After the records are entered, you must define the database range with the Data Set Database command.

Use these guidelines when you create your database:

- **Database size** A database can be as large as an entire worksheet.
- **Field name location** The first row of the database must contain the field names. You may want to leave several blank rows above or to the left of the database for entering criteria, tables, or other formulas.
- **Allowed values in field names** Field names must be text constants (if field names contain numbers, the field name must be enclosed in quotation marks to be interpreted as text). Do not use numbers, logical values, error values, blank cells, or formulas as field names. Otherwise, the database commands will not work properly.

- **Length of field names** Field names can be a maximum of 255 characters long. However, it's best to use brief field names and keep the contents of any field to a minimum. This makes it possible to use narrower column widths and view more of the database at one time. In addition, short field names make it easier to perform other operations such as database statistical calculations and extractions.
- **Records** Every record must have the same fields, but you don't have to enter data in each field. Be careful not to insert extra spaces at the beginning or end of each entry in a field; extra spaces can affect database functions or the results of a search.
- **Capitalization** You can use either uppercase or lowercase letters. Microsoft Excel ignores capitalization when searching or sorting a database.
- **Formulas** You can include worksheet formulas that calculate field values from other field values in a database. For example, you might have an Amount field that multiplies quantity ordered by price in every record. You can also perform calculations as part of your criteria when you find, delete, or extract information from the database. For information on creating worksheet criteria, see "Using Worksheet Criteria" in Chapter 10.

Creating a database

1 In the first row of the area that will become the database range, enter the field names.

2 Enter the records in the rows below the field names.

You can enter text, numbers, formulas, and functions in your database just as you would on a worksheet.

3 Select all the cells in the database range, including the field names and an extra blank row below the last record in the database for future expansion.

4 Choose Data Set Database to define the database range.

Microsoft Excel names the selected range of cells Database.

Setting up more than one database on a worksheet

When you choose a database command, Microsoft Excel looks for the name Database to determine which range of cells to work with. For this reason, only one database at a time can be defined with the name Database. However, you can set up several databases on a single worksheet, and switch between them by reassigning the name Database to different ranges of data.

1 Select the new database range, including field names and an extra blank row below the last record in the database.

2 Choose Data Set Database.

NOTE Another quick way to switch between databases is to use a macro. For information on creating macros, see Chapter 18, "Automating Tasks with Command Macros."

MORE ABOUT

More About Creating a Database

Guideline

Editing and Formatting a Database You can edit a database using any of the editing techniques for worksheets, such as adding or deleting rows and columns, or copying data. For information on worksheet editing procedures, see "Editing Worksheet Data" in Chapter 3 and Chapter 4, "Editing a Worksheet."

You can format the database with any of the worksheet formatting options, such as alignment or column width adjustments, font choices, and built-in or custom number formats. For more information on formatting, see Chapter 5, "Formatting a Worksheet."

When adding or formatting records, use the following guidelines to make sure that your database range remains valid and includes all records:

- If you add new or blank records with the Edit Insert command, make sure you insert them above the last record of the database. Otherwise, you must redefine the database range to include the new records. To avoid redefining the database, include a blank record at the end of the database range. Then, when you want to add new records, select the blank row and choose Edit Insert to add a blank row to the database above the selected row.

NOTE Another way to avoid redefining the database when you add new records is to use the data form. When you use the data form to add new records to your database, Microsoft Excel adds those records to the bottom of the database and automatically extends the database range to include those records. For information on using a data form, see "Editing Records with a Data Form," later in this chapter.

- Because all entries in a field are similar, it's usually best to use the same formats for an entire field (column). Exclude the field names when formatting a field because the same formats generally don't apply. Field names are often text, whereas the data they describe may be numbers or text in special formats.

Tips

Working with Large Databases Many of the display formats and options you use to view normal worksheet ranges—such as opening multiple windows or splitting a window into panes—are also useful for working with large databases. For example, if you split the worksheet window and place the field names in a separate window pane, you can scroll freely through a large database while keeping the field names in view. For information on opening multiple windows or splitting a window into panes, see "Changing How Your Worksheet Is Displayed" in Chapter 5.

MORE ABOUT

In addition, you can display the largest number of columns in your worksheet window by adjusting the column widths to the minimum width required to display the widest entry in each column. To do this, select the database range and choose the Best Fit button in the Format Column Width dialog box, or double-click the line to the right of the column heading.

Use the Name "Database" When Creating a Chart or Printing When you want to use your database information in a chart, use the Formula Goto command to find and select the database before you choose the File New command to create the chart. When you use the name Database in the Formula Goto command, you ensure that the chart area is correct. Likewise, to print only the database on your worksheet, use the Formula Goto command to find and select the database before you choose the Options Set Print Area command to define the database as the print area. To print the database, choose the File Print command.

Sorting a Database

You can reorganize the data in a database alphabetically or numerically with the Data Sort command. You can sort rows or columns in any selection and you can choose whether to sort the rows or columns in ascending or descending order.

You can specify up to three *sort keys* to sort a database. A sort key identifies which column to sort by when sorting rows, or which row to sort by when sorting columns. You can refer to any cell in a row or column to identify that row or column as a sort key.

If you use more than one sort key, columns or rows with the same entry for the first key are sorted according to the second and third keys. If you have not identified second and third keys, rows or columns with duplicates in the first key are left in the order in which they are found.

For example, if the fields in your database include Invoice, Date, Company, and Amount and you want to sort the database by Company, you specify Company as the first sort key. Any duplicate company names appear in the original order. However, if you specify Date as the second sort key, invoices for the same company are sorted by date.

The sort order that Microsoft Excel uses if you specify ascending order is:

- Numbers
- Text
- Logical values
- Error values
- Blanks

If you specify descending order, Microsoft Excel reverses the order of everything except blank cells, which are always sorted last. For information on the sort order within each of these categories, see "More About Sorting a Database," later in this section.

NOTE The procedures for sorting data in a database are the same as those for sorting selected data on a worksheet.

Online Help also provides information on sorting a database. To display online Help, choose the Window Help command. If you are using system software version 7.0 and the Help command does not appear on the Window menu, display Help by pointing to the Help menu icon and choosing the Microsoft Excel Help command. For information on a specific command, select the Commands topic. For information on using online Help, see "Using Help" in Chapter 1.

Sorting a database

IMPORTANT Be careful not to include the field names as part of the selection to be sorted. The field names for a database must always remain in the top row of the database.

1. Select the range you want to sort.

   Everything within that range will be reordered, based on the key rows or columns you specify. Nothing outside of that range will be affected by the sort.
2. Choose Data Sort.
3. To sort rows (keep rows intact), select the Rows option.

   To sort columns (keep columns intact), select the Columns option.
4. Enter the reference of your first key in the 1st Key box.

   If you are sorting by rows, this can be the reference of any cell in the column you want to use as your first key column. If you are sorting by columns, this can be the reference of any cell in the row you want to use as your first key row.

   You can accept the proposed reference, type a new one, or select one on the worksheet.
5. To sort by more than one key, enter references in the 2nd Key and 3rd Key boxes.
6. Select Ascending or Descending order for each key you specify.
7. Choose OK.

Undoing a sort

If you don't like the way your data was sorted, you can undo the sort immediately after you sort.

▶ Choose Edit Undo Sort.

Sorting with More Than Three Keys

You can sort with more than three keys by sorting two or more times. When you sort with more than three keys, keep these guidelines in mind:

- The most recent sort takes precedence, so you should always do the last sort with the keys that are most important.
- Microsoft Excel retains the previous sort sequence in places where the current sort produces equal items.

For example, if you want to use five key columns to sort the rows of a selection, do one sort using the fourth and fifth most important columns selected as the first and second keys. Then do a second sort using the three most important columns selected as the keys.

Sorting with more than three keys

1. Sort using the three least important keys. Of those three keys, use the most important as the first key, the next most important as the second key, and the least important as the third key.
2. Sort using the next three keys, again using the most important of the three as the first key.
3. Continue sorting in this manner until you have sorted using the most important keys.

MORE ABOUT

More About Sorting a Database

Guidelines

Sort Order For each key, select Ascending or Descending to specify the order in which you want the data sorted. In ascending order, Microsoft Excel sorts in the following order, top to bottom for rows and left to right for columns:

- **Numbers** From the largest negative number to the largest positive number.

MORE ABOUT

- **Text** According to the order shown in the following table. Microsoft Excel ignores capitalization when sorting text. The numbers shown in the text sort order refer to numbers that are entered as text values. Numbers that are entered as numeric values are sorted before text values.

Space	!	"	#	$	%	&	'	(	)	*	+	,	-	.	/	0
1	2	3	4	5	6	7	8	9	:	;	<	=	>	?	@	A
B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S
T	U	V	W	X	Y	Z	[	\	]	^	_	`	{	|	}	~	

- **Logical values** FALSE before TRUE.
- **Error values** All error values are equal.
- **Blanks** Always sorted last.

In descending order, Microsoft Excel reverses the order of everything except blank cells, which are always sorted last.

NOTE If you're using Microsoft Excel with an international version of the Macintosh system, Microsoft Excel sorts the data according to the sorting rules of the country in use.

Using Names Instead of Cell References as Sort Keys You can type a name in the 1st Key, 2nd Key, and 3rd Key boxes in the Data Sort dialog box instead of a cell reference. The name must already be defined on the active worksheet before you use it as a sort key. If the name refers to a range of cells, Microsoft Excel uses the upper-left cell in the named range as the sort key. For example, if the name Inventory refers to B5:C70, cell B5 would be used as the sort key.

Troubleshooting

Sorting Numbers If the range you are sorting contains numbers, make sure that you have entered the numbers as either all numeric values or as all text values. Otherwise, Microsoft Excel sorts the numbers entered as numeric values before sorting the numbers entered as text values. You can quickly check to see if Microsoft Excel is treating a cell as a number or text by looking at how the number is displayed in the cell. Unless you have used the Format Number command to change the cell display, cells use the default General format (numbers are right-aligned and text is left-aligned).

To enter a number as text, such as a postal code or part number, enter the text as a formula and type the numbers within double quotation marks. For example, if you type ="**98052**", Microsoft Excel interprets the postal code as text, not as a number.

Maintaining a Database with a Data Form

A data form is a dialog box that provides a simple way to view, change, add, and delete records in your database, or to find specific records based on criteria you specify.

You can use a data form without learning all the specifics of setting up criteria and extract ranges, or other details of database architecture. You might prefer this method if you're just starting to use databases or if you are setting up a database for someone else to enter data.

With a data form, you can view one complete record at a time. Microsoft Excel takes the field names you set up in your database and automatically creates a Data Form dialog box based on those field names. If you want to display the database information in a different format or arrangement, you can create a custom data form. For information on custom data forms, see "Creating a Custom Data Form," later in this chapter.

NOTE A database can contain as many records as you want. However, if you use the data form to display one record with many fields, the data form displays only as many fields as will fit in the form. You cannot scroll the data form to view the remaining fields.

The data form works independently of the other Data menu commands you use to manipulate a database—the Data Find, Data Extract, Data Delete, and Data Set Criteria commands. It also operates independently of any criteria range you may have set up on the worksheet. If you enter criteria in the data form to find database records, those criteria do not affect and are not affected by any criteria in the criteria range on the worksheet. You cannot extract records with a data form. For information on using the Data menu commands, see Chapter 10, "Analyzing and Reporting Database Information."

This section does not include procedures for printing a database, which involves the same steps used for printing any worksheet range.

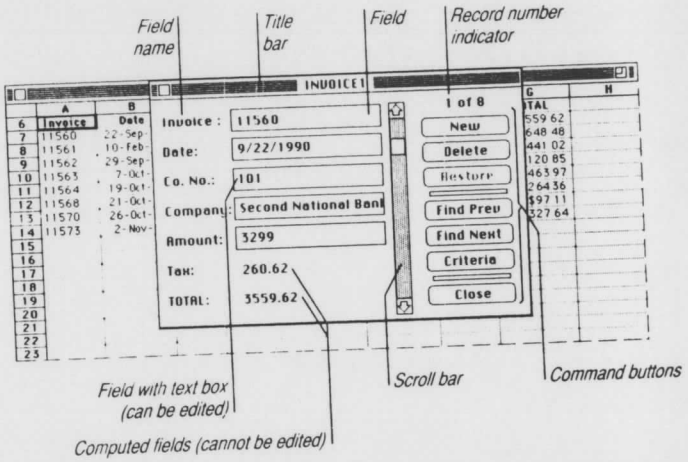
For information on	See
Setting up a criteria range and extracting data	"Using Worksheet Criteria" and "Extracting Records" in Chapter 10
Performing calculations	"Using Database Functions" in Chapter 10
Printing a database	Chapter 15, "Printing"

Online Help also provides information on maintaining a database with a data form. To display online Help, choose the Window Help command. If you are using system software version 7.0 and the Help command does not appear on the Window menu, display Help by pointing to the Help menu icon and choosing the Microsoft Excel Help command. For information on a specific command, select the Commands topic. For information on using online Help, see "Using Help" in Chapter 1.

The Parts of a Data Form

When you define a database and choose the Data Form command, Microsoft Excel creates a data form based on your database and displays it in the Data Form dialog box. The data form displays each field one record at a time and gives you access to all records in your database.

The following illustration shows the data form for the database example used earlier in this chapter and highlights the parts of a data form:



- **Field names** These are the field names from your database, listed in a column.
- **Fields** The column next to the field names contains the data for each field within the record. These fields collectively make up one database record.
- **Field with text box** This field includes field data you can edit with the data form. Any field that you can edit appears in a text box.
- **Field without text box** Any field you cannot edit appears without a text box. You cannot edit a field that is the result of a formula or function, or a field that is locked while the worksheet is protected.
- **Scroll bar** This bar shows your approximate position in the database and allows you to scroll through the records.

- **Record number indicator** This message indicates which record is displayed and how many records are in the database. Blank records at the end of the database are not counted. The record number indicator changes to "New Record" when you scroll to the first blank record after the last nonblank record in the database.
- **Title bar** This is the bar at the top of the data form that shows the name of the worksheet containing the database.

NOTE To see areas of your database behind the data form, drag the title bar of the data form with the mouse.

Editing Records with a Data Form

You can use a data form to edit the fields of a record, except for protected fields and computed fields. If you can edit a field, the data is displayed in a text box.

For information on locking a cell and protecting a worksheet, see "Protecting Documents and Windows" in Chapter 16.

IMPORTANT Changes to a record are saved permanently when you move to another record. Make sure your changes are correct before scrolling to another record. If you make changes to the fields in a record and then decide you want to cancel those changes, you can restore the record to its original contents by choosing the Restore button, as long as you do so before moving to a different record.

Editing records with a data form

To edit in a data form, use standard procedures for editing in a text box. For information on mouse and keyboard editing techniques, see "More About Maintaining a Database with a Data Form," later in this section.

1. Activate the worksheet containing the database.
2. Choose Data Form.
3. Scroll to and edit each record you want to change.
4. Choose the Close button when you finish working in the data form.

Canceling changes to a record

If you make changes to the fields in a record and then decide you want to cancel those changes, you can restore the record to its original contents, as long as you do so before moving to a different record.

▶ Before you scroll or make any further changes, choose the Restore button.

Adding records with a data form

You can use a data form to add a new, blank record to the bottom of your database. When you add a record, Microsoft Excel extends the database range to include the record. If there is no room below the database, Microsoft Excel displays a message. If any fields in the last nonblank record are computed, Microsoft Excel copies their formulas to the new record.

1. Activate the worksheet containing the database.
2. Choose Data Form.
3. Choose the New button.

   Microsoft Excel scrolls to the first blank record after the last nonblank record, and the record number indicator changes to "New Record."
4. Enter the data fields of the new record.

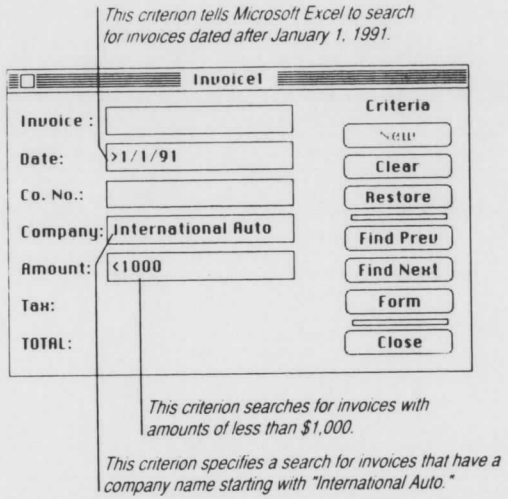
   When you finish entering information in the first field, click the next field with the mouse or press TAB to move to the next field. For complete information on moving among the fields in a data form, see "More About Maintaining a Database with a Data Form," later in this section.
5. When you finish entering the data fields, press ENTER.

   Microsoft Excel adds the new record to the database and displays another blank record. Repeat steps 4 and 5 to add as many records as you want.
6. Choose the Close button when you finish adding records.

Finding and Deleting Records with a Data Form

The data form scrolls through all records in your database. However, you can define criteria and use the Find Next and Find Prev buttons to find records matching the criteria you specify. *Criteria* are the instructions that Microsoft Excel uses to find these records. You can also use criteria to delete records from your database.

The following illustration shows how criteria might be specified in the data form example used earlier in this chapter. Microsoft Excel finds all invoices for International Auto Repair with amounts less than $1,000 and dated after January 1, 1991.



NOTE The type of criteria you can specify in a data form is called *comparison criteria*. You use comparison criteria to find records whose data matches or falls within certain limits of specified criteria. Another type of criteria used in Microsoft Excel is called *computed criteria*. With computed criteria, you type a formula that refers to one or more fields in your database as your criterion. You cannot specify computed criteria in a data form. For information on specifying computed criteria in a database, see "Using Worksheet Criteria" and "Entering Computed Criteria" in Chapter 10.

You can search the database for records that match these types of criteria:

- **A series of characters you want matched** Enter text, numbers, or logical values. In the illustration, "International Auto" is an example of entering text as a criterion. Microsoft Excel finds all records that begin with "International Auto."
- **A quantity you want compared** Enter one of the standard comparison operators in front of the value you want records compared to. In the illustration, ">1/1/91" and "<1000" are examples of using comparison operators with criteria. Microsoft Excel finds those records with invoice dates after January 1, 1991, and amounts less than $1,000.

  The six comparison operators are:

Operator	Meaning
=	Equal to
>	Greater than
<	Less than
>=	Greater than or equal to
<=	Less than or equal to
<>	Not equal to

  An equal sign with nothing after it will find only blank fields. A "not equal to" operator (<>) with nothing after it finds only nonblank fields. For more information on comparison operators, see "Entering a Formula," in Chapter 3.

- **A wildcard character—a special character that stands for one or more characters** Use a question mark (?) to find any single character in the same position as the question mark; for example, type **sm?th** to search for "smith" or "smyth." Use an asterisk (*) to find any number of characters in the same position as the asterisk—for example, type ***Inc.** to find all companies with "Inc." at the end of their company names.

  When you are searching a database, Microsoft Excel assumes there is an asterisk at the end of text you use as criteria. For example, if you type **smith** as your criterion, Microsoft Excel finds all clients whose names start with "Smith," such as Smith, Smithson, Smithsen, Smithers, and so on.

  To find an actual question mark or asterisk, precede it with a tilde (~). For example, to find FY91?, type **FY91~?** as your criterion.

For more information on finding text that shares some characters but not others, see "More About Using Worksheet Criteria," in Chapter 10.

Finding records with a data form

1 Activate the worksheet containing the database.

2 Choose Data Form.

3 Choose the Criteria button.

The data form changes to accept criteria. The record number indicator changes to the word "Criteria," the Criteria button changes to the Form button, and the Delete button changes to the Clear button. The Clear button clears all existing criteria.

4 In the boxes next to the field names, type the criteria you want Microsoft Excel to use when searching the database.

To return to the regular data form without searching the database, choose the Form button.

5 To search forward through the database and display the first record that matches the criteria, choose the Find Next button.

To search backward through the database and display the previous record that matches the criteria, choose the Find Prev button.

If there are no matching records in the direction you're searching, Microsoft Excel beeps and the last matching record remains selected.

6 When you finish, choose the Close button to exit the data form.

The criteria you use in the data form does not replace the criteria you define with the Data Set Criteria command on the worksheet. If you exit the Data Form and again choose the Data Find command, the criteria that you defined on your worksheet will be the criteria Microsoft Excel uses as it searches the records. For information on using worksheet criteria to find records, see "Finding Records" in Chapter 10.

Deleting records with a data form

You can use a data form to delete a record from your database. When you delete records in a database, Microsoft Excel automatically adjusts the database range.

IMPORTANT Deleted data cannot be restored with the Restore button or the Edit Undo command. Before choosing OK, make sure you want to delete all the information in the record.

1 Activate the worksheet containing the database.

2 Choose Data Form.

3 Display the record you want to delete.

You can specify criteria to find the record you want to delete.

4 Choose the Delete button.

Microsoft Excel displays a message asking for confirmation.

5 Choose OK.

Microsoft Excel deletes the data in the currently displayed database record and moves the other records up to fill the space.

MORE ABOUT

More About Maintaining a Database with a Data Form

Guidelines

Finding Matching Records When you use the Find Next or Find Prev buttons to display the records that match the criteria you defined, note that these buttons do not wrap around the bottom or the top of the database range.

Mouse and Keyboard Editing Techniques A data form is always displayed in the Data Form dialog box. To work in a data form, you use many of the standard mouse or keyboard techniques for working in dialog boxes. For more information on editing in a text box, see "Choosing Commands" in Chapter 1.

NOTE When Microsoft Excel creates field names in the data form, it includes an underlined letter in each field name and command button so you can use the keyboard. To display the underlined letter, choose Options Workspace and, under Command Underline, select On. To select a field or choose a command button with the keyboard, press COMMAND plus the underlined letter. If you select Automatic in the Command Underline box, Microsoft Excel displays the underlines when you use the keyboard to activate the menu.

To work in the data form with the mouse, use the standard mouse techniques given in the following table:

To	Do this
Select a field	Click field
Choose a command button	Click command button
Move to same field in next record	Click down arrow in scroll bar
Move to same field in previous record	Click up arrow in scroll bar
Move to same field 10 records forward	Click below the scroll box in scroll bar
Move to same field 10 records back	Click above the scroll box in scroll bar
Move to last record	Drag scroll box to bottom of scroll bar
Move to first record	Drag scroll box to top of scroll bar
Move and edit within a field	Click where you want the insertion point or drag through text to select it

MORE ABOUT

To work in the data form with the keyboard, use the keys given in the following table:

To	Press
Select a field	COMMAND+key for underlined letter in field name
Choose a command button	COMMAND+key for underlined letter in button
Move to same field in next record	DOWN ARROW
Move to same field in previous record	UP ARROW
Move to next field that you can edit in record	TAB
Move to first field in next record	ENTER
Move to first field in previous record	SHIFT+ENTER
Move to same field 10 records forward	PAGE DOWN
Move to same field 10 records back	PAGE UP
Move to last record	CTRL+PAGE DOWN
Move to first record	CTRL+PAGE UP
Move within a field	HOME, END, LEFT ARROW, RIGHT ARROW
Delete previous character	DELETE
Delete selected text	DELETE

Tip

Searching for Many Records You can specify criteria in the data form to help you find a specific record in your database. However, if you are searching for many records, it may be more efficient to use criteria defined on your worksheet with the Data Set Criteria command. For information on using worksheet criteria to find records, see "Finding Records" in Chapter 10.

Troubleshooting

Database Range Cannot Be Extended Microsoft Excel displays a message when there is data in the row below your database range. You should either delete this data or redefine the database range to include this data.

Creating a Custom Data Form

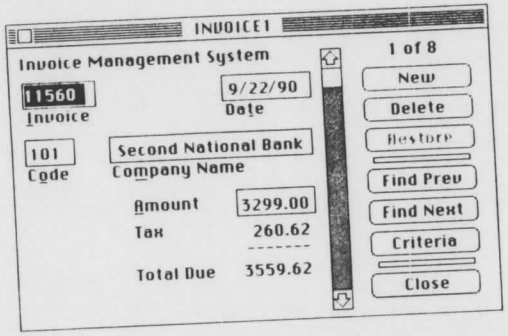
You can create a *custom data form* by customizing the form that appears when you choose the Data Form command. A custom data form is an ideal tool for setting up databases, especially for those users who are less familiar with database procedures.

Your custom form must contain the same elements as the default form:

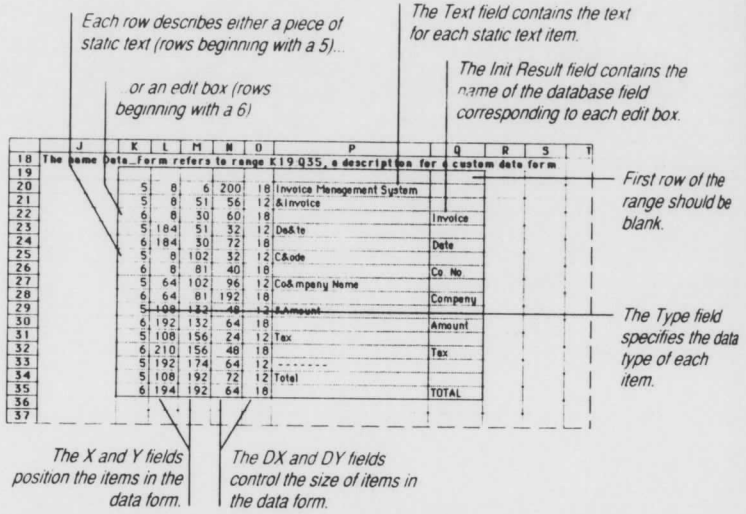
- **Static text** This includes the labels that identify fields and any extra labels you want to add to your form.
- **Edit boxes** These are boxes in which you can type and edit text and data for fields that are not protected or computed. Each edit box corresponds to a field in the database. For fields that are protected or computed, Microsoft Excel displays the field contents without the box and you cannot edit them.

The custom data form replaces the part of the default data form to the left of the scroll bar. The scroll bar and command buttons do not change.

The following illustrations and descriptions provide an example of a custom data form for the example database used earlier in this chapter. This example provides guidelines that you may find helpful when you're creating your own custom data forms. The following illustration shows the custom data form:



The description that produces this custom data form is shown in the following illustration:


Each row describes either a piece of static text (rows beginning with a 5)...
...or an edit box (rows beginning with a 6)
The Text field contains the text for each static text item.
The Init Result field contains the name of the database field corresponding to each edit box.
The name Data_Form refers to range K19:Q35, a description for a custom data form
Invoice Management System
&Invoice
Invoice
Da&te
Date
C&ode
Co No
Co&mpany Name
Company
&Amount
Amount
Tax
Tax
Total
TOTAL
First row of the range should be blank.
The Type field specifies the data type of each item.
The X and Y fields position the items in the data form.
The DX and DY fields control the size of items in the data form.

Creating a custom data form is the same as creating a custom dialog box. The range K19:Q35, named Data_Form, is the description that includes the following information about the custom dialog box:

- **Type field** Item types are indicated by a type number: 5 for static text you can use as labels and 6 for edit boxes in which you can enter text.
- **X and Y fields** The numbers in the X and Y columns indicate the horizontal and vertical position of each item in the dialog box, as well as the position of the dialog box on your screen.
- **DX and DY fields** The numbers in the DX and DY columns indicate the width and/or height of the dialog box and of the items within the dialog box.
- **Text field** The text column contains the text for static text items. Note the ampersands (&) in the Text field. Characters following an ampersand are underlined in the custom dialog box. As with other dialog boxes, you can press COMMAND plus the underlined letter to move to an item quickly.
- **Init/Result field** The Init/Result column contains the database field names, which link items in the custom data form to fields in your database.

You create a custom data form by using the Dialog Editor to design a data-entry dialog box, and then naming it "Data_Form" on the worksheet containing the database you want to use the data form with. For detailed instructions on creating custom dialog boxes, see "Creating a Custom Dialog Box" in Chapter 20.

Creating a custom data form

1. Use the Dialog Editor to create a custom dialog box that has edit boxes and text arranged as you want them to appear in the custom data form. Do not include OK or Cancel buttons in your custom data form, as Microsoft Excel automatically uses the command buttons associated with the built-in data form.

   The Dialog Editor is a separate application provided with Microsoft Excel. For information on creating custom dialog boxes with the Dialog Editor, see "Creating a Custom Dialog Box" in Chapter 20.

2. For each edit box, first select the edit box, and then choose Edit Info and type the name of the corresponding database field in the Init/Result box and choose OK.

3. With the custom data form active in the Dialog Editor, choose Edit Copy to copy the dialog box description to the Clipboard. This description includes the information about item types, text, size, and position.

4. Start or activate Microsoft Excel and open the worksheet containing the database with which you'll use the custom data form.

5. Select the first cell of the range where you want to paste the dialog box description. This cell becomes the upper-left corner of the range.

   The dialog box description is seven columns wide. Make sure that your worksheet contains no data in the cells where the dialog box description will be pasted because the dialog box description will replace any data in the range where it is pasted.

6. Choose Edit Paste.

   The dialog box description is pasted and remains selected.

7. Choose Formula Define Name.

8. In the Name box, type **data_form**

   Make sure the cell range containing the custom dialog box description is correct in the Refers To box.

9. Choose OK.

   Microsoft Excel uses the name Data_Form to find and display your custom data form when you choose the Data Form command.

MORE ABOUT

More About Creating a Custom Data Form

Guidelines

Defining the Database Before you use the custom data form, make sure that you have defined your database range with the Data Set Database command.

Defining the Name Data_Form When you define the name Data_Form as the cell range containing the description of the custom data form, do not insert any spaces. A name cannot contain spaces; use the underline character instead.

Tips

Adding Custom Help If you are developing a custom application, you can make the form even easier to use by adding custom Help to it. The procedure for doing this is the same as for custom dialog boxes. For information on adding custom Help, see "Creating a Custom Help Topic," in Chapter 20.

Simplifying the Data Form To simplify the data form, you can create a custom data form that includes only the fields that can be edited.

Analyzing and Reporting Database Information

With Microsoft Excel, you can find, retrieve, and delete information from a database. You can also use database functions to analyze information in your database.

Table of Contents

Using Worksheet Criteria ... 369
Finding Records ... 379
Extracting Records ... 381
Deleting Records ... 384
Using Database Functions ... 386

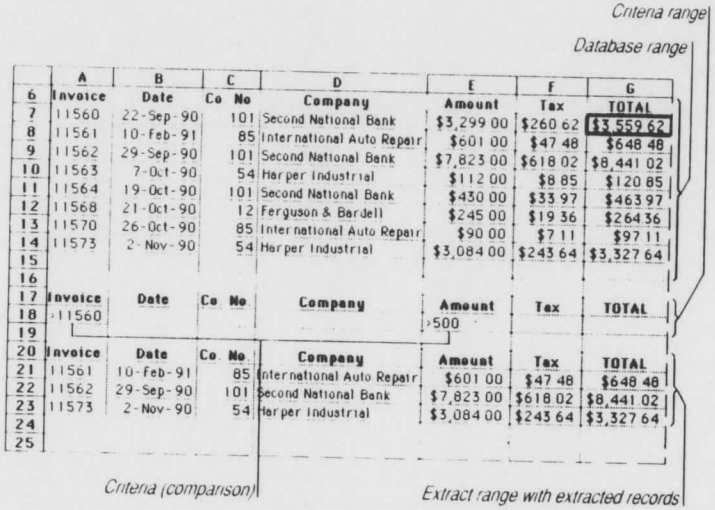
Using Worksheet Criteria

After you have created a database, you use *criteria* to tell Microsoft Excel which records in a database you want to find, extract, or delete. Criteria are the instructions that Microsoft Excel uses to find records in the database. You set up criteria in a separate range of cells on the worksheet; Microsoft Excel uses the criteria to "test" the database and find, extract, or delete the data that matches those criteria. For example, in a database of client invoices, you can specify that Microsoft Excel find all invoices for amounts greater than $500.

By entering criteria in a criteria range on a worksheet instead of a data form, you can specify combinations of criteria. For example, you can specify that Microsoft Excel find all invoices for amounts greater than $500 and less than $1,200. In a data form, you can specify only one criterion: >500 or <1200. For more information on criteria, see the following section, "Types of Criteria."

NOTE If you are new to Microsoft Excel or if you want to locate records one at a time to edit them or delete them from your database, it may be easier to specify criteria in a data form. However, you cannot use the data form to extract database records. For information on using a data form, see "Maintaining a Database with a Data Form" in Chapter 9.

When you extract specified records from a database, Microsoft Excel copies the records that meet the criteria in the criteria range from the database to another part of the worksheet or to another worksheet. The following illustration shows database, criteria, and extract ranges on the same worksheet:



	A	B	C	D	E	F	G
6	Invoice	Date	Co No	Company	Amount	Tax	TOTAL
7	11560	22-Sep-90	101	Second National Bank	$3,299 00	$260 62	$3,559 62
8	11561	10-Feb-91	85	International Auto Repair	$601 00	$47 48	$648 48
9	11562	29-Sep-90	101	Second National Bank	$7,823 00	$618 02	$8,441 02
10	11563	7-Oct-90	54	Harper Industrial	$112 00	$8 85	$120 85
11	11564	19-Oct-90	101	Second National Bank	$430 00	$33 97	$463 97
12	11568	21-Oct-90	12	Ferguson & Bardell	$245 00	$19 36	$264 36
13	11570	26-Oct-90	85	International Auto Repair	$90 00	$7 11	$97 11
14	11573	2-Nov-90	54	Harper Industrial	$3,084 00	$243 64	$3,327 64
15							
16							
17	Invoice	Date	Co No	Company	Amount	Tax	TOTAL
18	>11560				>500		
19							
20	Invoice	Date	Co No	Company	Amount	Tax	TOTAL
21	11561	10-Feb-91	85	International Auto Repair	$601 00	$47 48	$648 48
22	11562	29-Sep-90	101	Second National Bank	$7,823 00	$618 02	$8,441 02
23	11573	2-Nov-90	54	Harper Industrial	$3,084 00	$243 64	$3,327 64
24							
25							

In the preceding illustration, the range A6:G15 is the database range. To define the database range, you use the Data Set Database command. Microsoft Excel assigns the name Database to this range and you can use the name as you would any other named reference. For information on creating a database, see "Creating a Database" in Chapter 9.

In the illustration, the range A17:G18 is the criteria range. To define the criteria range, you use the Data Set Criteria command. Microsoft Excel assigns the name Criteria to this range.

The extract range is a separate range of cells you select on the worksheet where data extracted from the database is copied. When you extract data, Microsoft Excel finds records, based on the criteria you specify, and copies them to the extract range you select.

You can also use the Data Set Extract command to define the extract range. Microsoft Excel assigns the name Extract to this range. When you define the extract range with Data Set Extract, you don't have to select it each time you want to extract data. In the illustration, rows 21 through 23 contain the three records that meet the criteria specified in the criteria range.

Online Help also provides information on using worksheet criteria. To display online Help, choose the Window Help command. If you are using system software version 7.0 and the Help command does not appear on the Window menu, display Help by pointing to the Help menu icon and choosing the Microsoft Excel Help command. For information on a specific command, select the Commands topic. For information on using online Help, see "Using Help" in Chapter 1.

Types of Criteria

You can specify two types of criteria: comparison or computed.

You use *comparison criteria* when you want to find records whose data matches or falls within certain limits of specified criteria. Each comparison criterion must have a criterion name that is the name of the database field you want to examine. Microsoft Excel "tests" the database by comparing the value of a particular field against what you specify as the comparison criterion. In the preceding illustration, ">11560" and ">500" are comparison criteria. Microsoft Excel finds those records with invoice numbers higher than 11560 and amounts greater than $500.

If you want to find records that meet criteria that do not exist as a field in a database, you can use *computed criteria*. This type of criterion "tests" the database against the result of a formula that refers to one or more fields in one or more records. For example, you might want to find records where the quantity ordered times the price is greater than $500. If you have an Amount field that already multiplies quantity and price, you can enter **>500** as the comparison criterion. If you do not have an Amount field, however, you can enter the formula **=quantity*price>500** as the computed criterion. Microsoft Excel evaluates this formula for each record to see if the criterion is met.

For information on entering comparison and computed criteria, see "Setting Up a Criteria Range" following in this section, and "Entering Comparison Criteria," and "Entering Computed Criteria," later in this section.

You can also find records that match more than one criterion or match some combination of several criteria. For information on combining criteria, see "Combining Criteria," later in this section.

Setting Up a Criteria Range

The *criteria range* is a separate range of cells on the worksheet in which you enter the criteria used to find, extract, or delete matching database records. The criteria range can be any area on the worksheet outside your database range, or it can be on another worksheet. Setting up a criteria range is similar to setting up a data-base range.

There are three steps to creating your criteria range:

- In one row of the worksheet, enter the criteria names.
- In the rows below the criteria names, enter the criteria.
- Define the criteria range—the area where you entered the criteria names and the criteria.

The first row of the criteria range must contain the criteria names. Enter the criteria in one or more rows beneath the first row containing the criteria names. The criteria range must be at least two rows high and one column wide, but can be as large as you want.

If you are using comparison criteria, the comparison criteria names must be the same as the names of the database fields you want the criteria to test. An easy way to ensure that your criteria field names match the database field names is to copy them directly from the database. You need to include only the names of fields you are interested in, in any order, but they must be in the first row of the criteria range.

If you are using computed criteria, the computed criterion name can be any name except the name of a database field; otherwise, Microsoft Excel tries to interpret the criterion under the name as a comparison criteria. In general, you should create a name that describes the formula you will use for the computed criteria.

Below the criteria names, you type the criteria. To enter comparison criteria, you type either the exact value or text you want Microsoft Excel to find as your criteria, or a comparison operator followed by a value or text. For computed criteria, you type a formula.

For more information on entering criteria and combining criteria, see "Entering Comparison Criteria," following in this section, and "Entering Computed Criteria" and "Combining Criteria," later in this section.

After you set up your criteria range, you can choose the Data Find command to find specific records, the Data Extract command to copy matching records to another part of your worksheet, or the Data Delete command to delete records that you no longer need.

Once you have defined a criteria range, you can change the criteria as often as you want. Each time you find, delete, or extract data, Microsoft Excel uses only the criteria currently in the criteria range.

NOTE The criteria range on your worksheet is completely independent from any criteria you define while using a data form. For information on finding or deleting records with a data form, see "Maintaining a Database with a Data Form" in Chapter 9.

Defining a criteria range

To tell Microsoft Excel where your criteria range is, you define the criteria range with the Data Set Criteria command.

1. Select the area that contains or will contain your criteria names and criteria.
2. Choose Data Set Criteria.

   Microsoft Excel names the range Criteria.

You can use the name Criteria as you would any other named reference. For example, to quickly select the criteria range, choose the Formula Goto command and select the name Criteria.

Setting up more than one criteria range on a worksheet

You can keep more than one criteria range on your worksheet and then define each one as you need to use it, but you can have only one criteria range defined at a time. By using different criteria ranges, you can quickly see the results from analyzing your data in different ways.

1. Select the new criteria range, including field names.
2. Choose Data Set Criteria.

NOTE Another quick way to switch between criteria ranges is to use a macro. For information on creating macros, see Chapter 18, "Automating Tasks with Command Macros."

Entering Comparison Criteria

You can enter these types of comparison criteria to find records that match the criteria:

- **A series of characters you want matched** If you want to find records that contain an exact value, you type the text, number, date, or logical value below the criteria name. For example, if you type **59401** below the Postal Code criteria name in your criteria range, Microsoft Excel finds all the records of customers in the database whose postal code is 59401.
- **A quantity you want compared** If you want to match records that fall within certain limits, type a comparison operator followed by the value, under the criteria name. For example, to find all the transactions of more than $10,000, you would type **>10000** as your criterion below the Amount field.

  The six comparison operators are:

Operator	Meaning
=	Equal to
>	Greater than
<	Less than
>=	Greater than or equal to
<=	Less than or equal to
<>	Not equal to

An equal sign with nothing after it will find only blank fields. A "not equal to" operator (<>) with nothing after it finds only nonblank fields. For more information on comparison operators, see "Entering a Formula" in Chapter 3.

- **A wildcard character—a special character that stands for one or more characters** You can use wildcard characters to find text that shares some characters but not others. A wildcard character is a special character that stands for any other characters in text. Microsoft Excel recognizes two wildcard characters: a question mark and an asterisk. Use a question mark (?) to find any single character in the same position as the question mark; for example, type **sm?th** to search for "smith" or "smyth." Use an asterisk (*) to find any number of characters in the same position as the asterisk—for example, type ***inc.** to find all companies with "Inc." at the end of their company names.

  When you are searching a database, Microsoft Excel assumes there is an asterisk at the end of text you use as criteria. For example, if you type **smith** as your criterion, Microsoft Excel finds all clients whose names start with "Smith," such as Smith, Smithson, Smithsen, Smithers, and so on.

  To find an actual question mark or asterisk, precede it with a tilde (~). For example, to find FY91?, type **fy91~?** as your criterion.

Entering Computed Criteria

With computed criteria, you type a formula as your criterion. The formula must refer to one or more fields in your database and produce the logical value TRUE or FALSE. To refer to fields in the formula, use either the field name or the cell reference of that field in the first record of your database. Make sure that you type the exact field name; capitalization is ignored.

The formula can also refer to constant values or to values outside the database. When you refer to a value outside the database, use an absolute reference to allow for sorting or expansion of data.

The computed criterion name can be any name except the name of a database field; otherwise, Microsoft Excel tries to interpret the criterion under the name as a comparison criteria. For example, if your product price list database does not include an end-of-the-year 25% price reduction but you need to subtract this price reduction when figuring total sales, you could still find the records of products whose sales exceed $550 by typing the formula **=price–(price*.25)>550** as the computed criterion and "Sale Price" as the criteria name. Note that because the computed criterion name does not identify the database field to use, the computed criterion must refer to at least one database field name ("price" in this example).

Microsoft Excel evaluates the formula once for each record and selects the record if the formula's result is TRUE or a number other than zero. Microsoft Excel does not select the record if the formula's result is FALSE, zero, a text value, or an error value.

The following criteria range will find records of all customers whose first purchase plus second purchase totals more than $100.

Cell A2 contains the formula =D6+E6>100. TRUE is displayed because this formula is TRUE for the first record.

	A	B	C	D	E	F
1	Total					
2	TRUE					
3						
4						
5	**Last Name**	**First Name**	**Postal Code**	**1st Purch**	**2nd Purch**	**Date 1st Purch**
6	Braun	Edna	81107	$145.75	$0.00	7/2/90
7	Brown	Phillip	44935	$27.35	$0.00	11/10/90
8	Frei	John	62101	$50.00	$15.75	12/28/90
9	McIntyre	Janet	98111	$6.95	$0.00	1/19/90
10	Samuels	Carol	30033	$56.95	$32.35	6/30/90
11	Smith	Jane	94117	$21.07	$172.50	1/19/90
12						
13						

Criteria range

If you want to use a formula that depends on a field in a record other than the one being tested, refer to the field above or below the first record in the database. For example, you might want to find records where one client's first purchase was more than 10 days after the previous client's first purchase. You would build the formula so that you refer to the field containing the date in the second record (F7 in the illustration), minus the date in the field directly above that field (F6).

If you refer to a field by using its name in a formula, make sure it is a valid Microsoft Excel name, with no spaces. For example, you would type **last_name** to refer to the Last Name field. For more information on valid Microsoft Excel names, see "Naming Cells and Formulas" in Chapter 6.

You can enter field names in formulas without first defining them with the Formula Define Name command. If you enter a field name you didn't define as a name with Formula Define Name, the error value #NAME? is displayed in the criterion cell, but the name is still recognized as a field name.

Combining Criteria

You can combine comparison and computed criteria to find records that match more than one criterion or match some combination of several criteria.

There are three ways to combine criteria:

- Select records that match one criterion and another criterion.

  For example, you can find records of customers whose last names begin with B and who made a first purchase greater than $50.

- Select records that match one criterion or another criterion.

  For example, you can find records of customers who have postal codes less than 40000 or greater than 90000.

- Any combination of "and's" and "or's."

For example, you can find records of customers who spent more than $50 on their first purchase and whose postal codes are less than 40000 or greater than 90000.

You specify "and's" and "or's" by where you position different criteria within a criteria range. To connect criteria by an "and" relation, enter them in the same row. If the "and" applies to the same field name (for example, Total>100 and Total<200), then you must duplicate the field name in the criteria range. To connect criteria by an "or" relation, enter them in different rows. You must redefine the criteria range if you add rows to an already named criteria range. Microsoft Excel finds any records that meet all the criteria in any one row of the criteria range.

This criteria range will find all customers whose last names begin with B and who made a first purchase greater than $50:

	A	B	C	D	E	F
1	**Last Name**	**1st Purch**				
2	B	>50				
3						
4						
5	**Last Name**	**First Name**	**Postal Code**	**1st Purch**	**2nd Purch**	**Date 1st Purch**
6	Braun	Edna	81107	$145.75	$0.00	7/2/90
7	Brown	Phillip	44935	$27.35	$0.00	11/10/90
8	Frei	John	62101	$50.00	$15.75	12/28/90
9	McIntyre	Janet	98111	$6.95	$0.00	1/19/90
10	Samuels	Carol	30033	$56.95	$32.35	6/30/90
11	Smith	Jane	94117	$21.07	$172.50	1/19/90
12						
13						

This criteria range will find records of all customers whose postal codes are less than 40000 or greater than 90000:

	A	B	C	D	E	F
1	**Postal Code**					
2	<40000					
3	>90000					
4						
5	**Last Name**	**First Name**	**Postal Code**	**1st Purch**	**2nd Purch**	**Date 1st Purch**
6	Braun	Edna	81107	$145.75	$0.00	7/2/90
7	Brown	Phillip	44935	$27.35	$0.00	11/10/90
8	Frei	John	62101	$50.00	$15.75	12/28/90
9	McIntyre	Janet	98111	$6.95	$0.00	1/19/90
10	Samuels	Carol	30033	$56.95	$32.35	6/30/90
11	Smith	Jane	94117	$21.07	$172.50	1/19/90
12						
13						

This criteria range will find records of all customers who spent more than $50 on their first purchase and whose postal codes are less than 40000 or greater than 90000:

	A	B	C	D	E	F
1	**1st Purch**	**Postal Code**				
2	>50	<40000				
3	>50	>90000				
4						
5	**Last Name**	**First Name**	**Postal Code**	**1st Purch**	**2nd Purch**	**Date 1st Purch**
6	Braun	Edna	81107	$145.75	$0.00	7/2/90
7	Brown	Phillip	44935	$27.35	$0.00	11/10/90
8	Frei	John	62101	$50.00	$15.75	12/28/90
9	McIntyre	Janet	98111	$6.95	$0.00	1/19/90
10	Samuels	Carol	30033	$56.95	$32.35	6/30/90
11	Smith	Jane	94117	$21.07	$172.50	1/19/90
12						
13						

MORE ABOUT

More About Using Worksheet Criteria

Guidelines

Using Text in Comparison Criteria When you type text as a comparison criterion, Microsoft Excel finds everything that begins with what you type. For example, if you type **br** instead of **braun** below the Client field, Microsoft Excel finds records for both Braun and Brown. Capitalization is ignored.

NOTE To match the value *text* exactly, use the following form:

="=*text*"

For example, if you want to find the record for only Smith, and not for Smithson, you would type **="=smith"**

Using a Formula That Produces Text as a Comparison Criterion The criterion can also be the result of a formula that produces text. For example, to select all records for the last 30 days, you could type the criterion **=">="&now()–30** below the Date field.

Matching Every Record in a Database To match every record in a database, include a blank row in your criteria range. This criteria range will find every record in the database. For example, you could match every record in a database when you want to apply the same formatting to each record.

MORE ABOUT

Defining a Criteria Range on a Separate Worksheet You can set up your worksheet to perform database operations using a criteria range on another worksheet. By defining the name Criteria as a range of cells on another worksheet, you can fill a worksheet with database records without having to leave a blank area for the criteria range. To use the criteria range on the other worksheet, activate the worksheet you want to perform the database operations on and use the Formula Define Name command to make the name Criteria an external reference.

For information on defining names, see "Naming Cells and Formulas" in Chapter 6. For information on external references, see "Linking Documents" in Chapter 8.

Tips

Creating Criteria Names A quick way to create criteria names for comparison criteria is to copy and paste your field names from the database range to the first row of your criteria range. This also ensures accuracy—the criteria names must be the same as the field names with no leading or trailing spaces.

Placing the Criteria Range If you change the criteria frequently, put your criteria range where it is easy to edit. You may want the criteria range just above the database or to one side of the database, so if you expand the database you don't have to move the criteria range.

If you will be changing your criteria frequently to find different information, display the criteria range in a separate window so you can move back and forth between your database and criteria without having to scroll each time. You can display the windows side by side. For information on using windows this way, see "Changing How Your Worksheet Is Displayed" in Chapter 5.

Extracting a Random Number of Records from a Database For statistical analysis, you may want to obtain a random sample of records from a large database such as the listings in a local telephone book. For example, if you want the random sample to consist of 10 percent of the database, you can specify this criteria range:

	A	B	C	D	E
1	Last Name	First Name	Address	Phone Number	=TRUE
2					=RAND()<10%
3					
4					

For information on using the RAND function to generate random numbers, see "Database Functions" in the *Microsoft Excel Function Reference*.

Finding Records

After you set up and define both your database and criteria range, you can use the Data Find command to select records in the database that match the criteria in the criteria range. You can scroll only to matching records. When you finish finding the records you want, you must exit Data Find.

Online Help also provides information on finding records. To display online Help, choose the Window Help command. If you are using system software version 7.0 and the Help command does not appear on the Window menu, display Help by pointing to the Help menu icon and choosing the Microsoft Excel Help command. For information on a specific command, select the Commands topic. For information on using online Help, see "Using Help" in Chapter 1.

Finding records

1. Make sure you have defined both your database range and your criteria range.
2. Choose Data Find.

   Microsoft Excel selects the first database record that matches the criteria in the criteria range.

For information on scrolling to the next matching record, see "More About Finding Records," following in this section.

Exiting Data Find

▶ Choose Data Exit Find.

You can also exit Data Find by editing the formula or value in a cell in the database range, selecting a cell outside the database range, choosing another command, or pressing COMMAND+PERIOD.

MORE ABOUT

More About Finding Records

Guidelines

How Microsoft Excel Finds Records If the active cell is outside the database when you choose the Data Find command, Microsoft Excel selects the first record in the database that matches the criteria. If the active cell is inside the database when you choose Data Find, Microsoft Excel selects the first record below the active cell that matches the criteria. If no records below the active cell match the criteria, Microsoft Excel searches from the top of the database and selects the first record that matches the criteria. If no records match, a message is displayed.

To start the search in reverse order, hold down SHIFT when you choose Data Find. Microsoft Excel selects the last record in the database that matches the criteria or, if the active cell is inside the database, the first record above the active cell that matches the criteria.

MORE ABOUT

Scrolling in Data Find Scrolling in Data Find is different from scrolling in your worksheet. When you scroll, Microsoft Excel scrolls only to database records that match the criteria defined in the criteria range.

To scroll in Data Find with the mouse, use the actions shown in the following table:

To find	Do this
The next or previous matching record	Click the down arrow or up arrow in the scroll bar
The next or previous matching record at least one window away	Click below or above the scroll box
The next or previous matching record in a particular area of the database	Drag the scroll box to the relative position in the scroll bar

If there are no matching records in the direction you scroll, Microsoft Excel beeps and the last matching record remains selected.

To scroll in Data Find with the keyboard, use the actions shown in the following table:

To find	Press
The next matching record	COMMAND+F
The previous matching record	SHIFT+COMMAND+F
The next matching record at least one window down from the selection	PAGE DOWN
The previous matching record at least one window up from the selection	PAGE UP

To move horizontally, press the RIGHT ARROW key to move right and the LEFT ARROW key to move left. You cannot move beyond the right or left boundary of the database.

Tips

Finding a Specific Database Record If you want to find a specific record in your database, you may prefer to specify criteria in the data form. For information on using the data form, see "Finding and Deleting Records with a Data Form" in Chapter 9.

MORE ABOUT

Finding and Updating Database Records You can use the Data Find command to find and update matching database records. First, use Data Find to select the first matching record in your database, and then edit this record. When you choose Data Find again, Microsoft Excel selects the next matching record for you to update.

NOTE If you exit the Data Find command by selecting a cell outside of the database range, choosing Data Find again will start the search from the beginning of the database.

For information on finding and replacing data on the entire worksheet, rather than just in the database, see "Finding and Replacing Cells and Data" in Chapter 4.

Extracting Records

You can extract specified records from the database with the Data Extract command. Extracting is copying specified fields of records that meet the criteria in the criteria range from a database to another part of the worksheet. You can summarize the information you extract from a database in a report. For example, you could use a criterion that finds records for clients who did less than $50,000 of business with you last year. You can also extract only partial records by extracting only the names and addresses of those clients who did less than $50,000 of business with you.

Online Help also provides information on extracting records. To display online Help, choose the Window Help command. If you are using system software version 7.0 and the Help command does not appear on the Window menu, display Help by pointing to the Help menu icon and choosing the Microsoft Excel Help command. For information on a specific command, select the Commands topic. For information on using online Help, see "Using Help" in Chapter 1.

Setting Up an Extract Range

Before extracting records from a database you must select an *extract range*. An extract range is a range just like a criteria range or a database. The extract range must be outside of your database. The extract range can be either a range containing only field names or a range containing field names and the cells that will contain the extracted data. Follow these steps to create an extract range:

- Enter the field names in one row of the worksheet. The field names in the extract range must match the database field names exactly.
- Define or select the extract range.

The first row of your extract range must contain field names identical to those in your database. You don't need to include every field name from your database in the extract range, however. When you extract, only the fields that you specify in the first row of your extract range are copied into the extract range. An easy way to ensure that your extract field names match the database field names is to copy them directly from the database.

You do not have to define an extract range before extracting data; you can simply enter the field names and select the extract range before choosing the Data Extract command. However, if you define the extract range by using the Data Set Extract command, you can use the name Extract as a named reference with the Formula Goto command or with Microsoft Excel's database functions. If you want to just select the extract range, you do not need to use the Data Set Extract command to define the extract range before extracting data.

Defining an extract range

To do this procedure, you must be using full menus.

1. Select the area that contains or will contain your extract field names and extracted records.
2. Choose Data Set Extract.

   Microsoft Excel names the range Extract.

You can use the name Extract as you would any other named reference. For example, to select the extract range quickly, choose the Formula Goto command and select the name Extract.

Extracting Data to an Extract Range

Before you can extract records from a database, you need to:

- Define the database range with the Data Set Database command.
- Enter criteria and define the criteria range with the Data Set Criteria command.
- Define or select an extract range with the Data Set Extract command.

The Data Extract command uses the criteria range to select the records from which to extract fields.

IMPORTANT Any values or formulas below the field names in the extract range are replaced with the extracted information. If the extract range contains only the field names, all cells below the field names to the bottom of the worksheet are cleared whether information is extracted into them or not. Make sure that you do not have important data in a column below an extract range containing only field names, or it will be permanently lost. You cannot reverse the Data Extract command with the Edit Undo command.

Extracting data from the database

To do this procedure, you must be using full menus.

1. Make sure the database and criteria ranges are defined.
2. Define or select the extract range.
3. Choose Data Extract.
4. To extract only one copy of repeated records, turn on the Unique Records Only check box.
5. Choose OK.

   Microsoft Excel copies the matching database records into the extract range.

MORE ABOUT

More About Extracting Records

Guidelines

How Records Are Copied to the Extract Range The way Microsoft Excel copies data to the extract range depends on how you define or select the extract range.

If you define or select an extract range that contains only the field names, Microsoft Excel copies the extracted records into the cells directly below the field names.

If you define or select an extract range that contains the field names and the rows below the field names, Microsoft Excel extracts only as many records as will fit in that range. If the extract range cannot hold all of the extracted records, Microsoft Excel displays a message indicating that the extract range is full. If this happens, either make the extract range larger and extract again, or include only the extract field names in the extract range.

Formulas in Records If a record contains a formula, the extract range will contain only the value produced by that formula and not the formula itself.

Extracting Records from an External Database By defining the name Database as a range of cells on another worksheet or macro sheet using an external reference, you can extract records from the external database. This is useful for copying the extracted information into a report. You may also want to do this when you're working with a very large database. For information on defining names, see "Naming Cells and Formulas" in Chapter 6. For information on external references, see "Linking Documents" in Chapter 8.

For example, to extract records from range A1:D200 on the Tax worksheet to the Summary worksheet containing the extract range and criteria you would activate Summary and use the Formula Define Name command to define an external reference formula (=TAX!$A$1:$D$200) as the name Database. If the range on the external sheet is already defined as a database, you can use the name Database instead of the cell references.

MORE ABOUT

Tips

Creating Field Names in Your Extract Range A quick way to create extract names is to copy and paste your field names from the database range to the first row of your extract range. This also ensures accuracy—the extract names must be the same as the field names with no leading or trailing spaces.

Placing the Extract Range You may make frequent changes in the extract range, so put your extract range where it will be easy to edit. You may want the extract range next to the database so that if you expand the database you don't have to move the extract range.

If you will be changing your criteria frequently to find different information, display the extract range in a separate window so you can move back and forth between your criteria range and your extract range without having to scroll each time. You can display the windows side by side. For information on using windows this way, see "Changing How Your Worksheet Is Displayed" in Chapter 5.

Creating a Lookup Table to Use with a Database Range or an Extract Range You can create a lookup table on your worksheet to use with your database or extract range. For example, a database that lists invoices might use a lookup table that shows the discounts used for different customers, depending on the type of account they have and the amount of their invoice. For information on creating a lookup table, see "Creating a Lookup Table" in Chapter 7.

Deleting Records

You can use the Data Delete command to delete database records that match the criteria in the criteria range. Make sure that you do not include any blank rows in the criteria range when you choose the Data Delete command. When there is a blank row in the criteria range, Microsoft Excel matches every record in the database and all records are deleted.

Online Help also provides information on deleting records. To display online Help, choose the Window Help command. If you are using system software version 7.0 and the Help command does not appear on the Window menu, display Help by pointing to the Help menu icon and choosing the Microsoft Excel Help command. For information on a specific command, select the Commands topic. For information on using online Help, see "Using Help" in Chapter 1.

IMPORTANT The Data Delete command permanently deletes all records matching the criteria. You cannot reverse the Data Delete command with the Edit Undo command. To be sure that the Data Delete command will delete the right records, use the Data Find or Data Extract commands to preview the records that the Data Delete command will delete.

Deleting records

To do this procedure, you must be using full menus.

1. Define a criteria range that contains the criteria for the records you want to delete.
2. Choose Data Delete.

   A message warns you that matching records will be deleted permanently from the database.
3. Choose OK.

MORE ABOUT

More About Deleting Records

Guideline

How Cells Shift When You Delete Records When you use the Data Delete command to delete records from the database, the other records in the database shift up to fill any gaps, but the rest of the worksheet is not affected. The cells below the database do not shift up, as they do if you use the Edit Delete command.

Tips

Deleting a Specific Database Record If you want to delete a specific record in your database, you may prefer to specify criteria in the data form. For information on using the data form, see "Finding and Deleting Records with a Data Form" in Chapter 9.

Save Before You Delete It's a good idea to use the File Save command to save the worksheet before you use the Data Delete command. If you inadvertently delete records you didn't want to delete, you can close the worksheet without saving the changes, and then use the File Open command to open the worksheet again.

Using Database Functions

Microsoft Excel has 12 worksheet functions specifically designed to work with databases. The database functions perform calculations on fields in a database according to criteria you define. For example, you could find the employee who sold the most overseas airline tickets in the month of March by using the DMAX function to locate the record that has the largest number of overseas airline tickets sold.

Online Help also provides information on using database functions. To display online Help, choose the Window Help command. If you are using system software version 7.0 and the Help command does not appear on the Window menu, display Help by pointing to the Help menu icon and choosing the Microsoft Excel Help command. For information on a specific function, select the Worksheet Functions topic. For information on using online Help, see "Using Help" in Chapter 1.

How to Use a Database Function

To use a database function, you must specify three arguments: *database*, *field*, and *criteria*. These arguments tell Microsoft Excel which worksheet cells are used in the database function. *Database* is the range of cells that make up the database. If you used the Data Set Database command to define a selected range of cells, you can use the name Database as an argument. You can use any range of data, however, with the database functions. *Field* indicates which field is used in the function. *Criteria* is the range of cells that contains the database criteria. If you used the Data Set Criteria command to define a selected range of cells, you can use the name Criteria as an argument.

Every database function operates on the values in the field column of records that match the criteria you have defined in the database. There are 12 worksheet functions designed to work with databases:

To	Use
Average numbers	DAVERAGE
Count numbers	DCOUNT
Count nonblank cells	DCOUNTA
Extract a single value	DGET
Find a maximum	DMAX
Find a minimum	DMIN
Multiply numbers	DPRODUCT
Calculate standard deviation	DSTDEV or DSTDEVP
Add numbers	DSUM
Calculate variance	DVAR or DVARP

For complete information on the database worksheet functions, see "Database Functions" in the *Microsoft Excel Function Reference*.

MORE ABOUT

More About Using Database Functions

Guideline

Using Names as Arguments When you use the name of a range, such as Database or Criteria, as an argument in a database function, make sure that the name is not enclosed within double quotation marks and that you have defined each range before using the function.

Tips

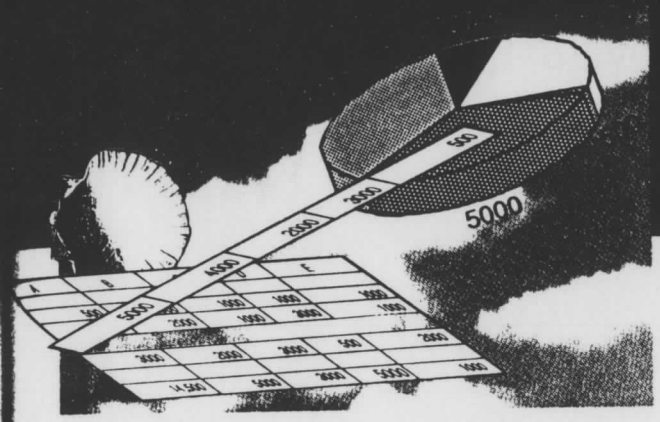
Using the Formula Paste Function Command To save time and ensure accuracy, instead of typing the name of the function you want, choose the Formula Paste Function command and select the function you want. The dialog box lists the worksheet functions alphabetically. Type **d** to go to the area of the list that displays the database functions.

Performing an Operation on an Entire Column in a Database Enter a blank line below the field names in the criteria range. If an entire row in the criteria range is blank, all of the records in the database will be used to evaluate the function.

Troubleshooting

Using DGET DGET extracts only one value from a database. Make sure that the criteria specifies only one record. DGET returns the value of the field from the record in the database that satisfies the criteria.

Using DCOUNT and DCOUNTA To obtain the number of times a specific number or range appears, use DCOUNT. To obtain the number of times a specific text entry appears, use DCOUNTA.



Charts

Part 4 Table of Contents

Chapter 11 Creating a Chart ... 391
Creating a chart from worksheet data. Controlling and changing the type of chart you want. Overlaying one chart with another. Saving a chart.

Chapter 12 Editing a Chart ... 433
Selecting, adding, editing, and deleting information in a chart.

Chapter 13 Formatting a Chart ... 451
Adding, deleting, and formatting the parts of a chart. Making picture charts. Changing the appearance of 3-D charts.

Creating a Chart

You can present your worksheet data more effectively and make it easier to understand and analyze if you show it graphically in a chart. Charts are especially useful in reports and presentations. With Microsoft Excel, you can plot your worksheet data in a chart quickly and easily.

NOTE Unless otherwise noted, all information and procedures for working with worksheets also apply to macro sheets.

Table of Contents

Creating a New Chart ... 391
Changing the Chart Type or Format ... 408
Creating an Overlay Chart ... 422
Saving a Chart ... 427
Closing a Chart ... 431

Creating a New Chart

A chart is a graphic representation of worksheet data. Microsoft Excel offers 11 types of charts to choose from—seven two-dimensional chart types and four three-dimensional (3-D) chart types. You can select from a number of built-in formats for each chart type, or, on any chart, you can add your own custom formatting to create exactly the kind of chart you need.

When you create a chart, Microsoft Excel plots the chart based on the shape of the worksheet range that contains the data you want in the chart, and based on the types of data in the rows and columns.

Initially, Microsoft Excel is set to plot your new charts as column charts. The column chart is the default or the *preferred* chart format. After you create a new chart, you can then easily choose a different chart type and, if necessary, customize the formatting to produce the chart you want. If you want, you can change the preferred chart format that Microsoft Excel uses to create new charts. For information on changing the preferred chart format, see "Changing the Chart Type or Format," later in this chapter.

You can create a chart right on a worksheet, or as a separate document in its own window. A chart created on a worksheet is called an *embedded* chart.

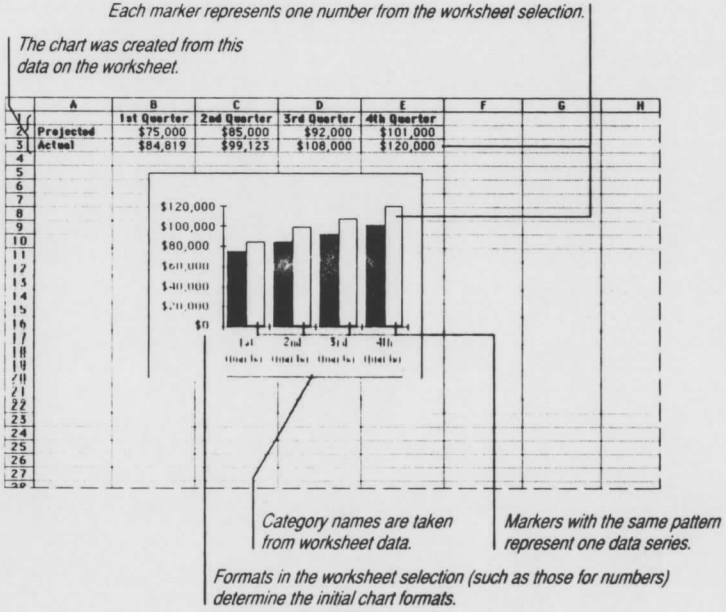
An embedded chart is linked to its source data, but unlike a chart document, an embedded chart is saved as part of the worksheet in which it was created. An embedded chart is a type of graphic object which you can move, size, attach to

cells, or have macros assigned to. An embedded chart is useful if, for example, you want to create a report with text, numbers, and charts on the same page. You should create the chart on the worksheet if you always want the chart to be displayed or printed with worksheet data or graphics. For more information on working with and formatting graphic objects, see Chapter 14, "Using Graphics on Microsoft Excel Worksheets."

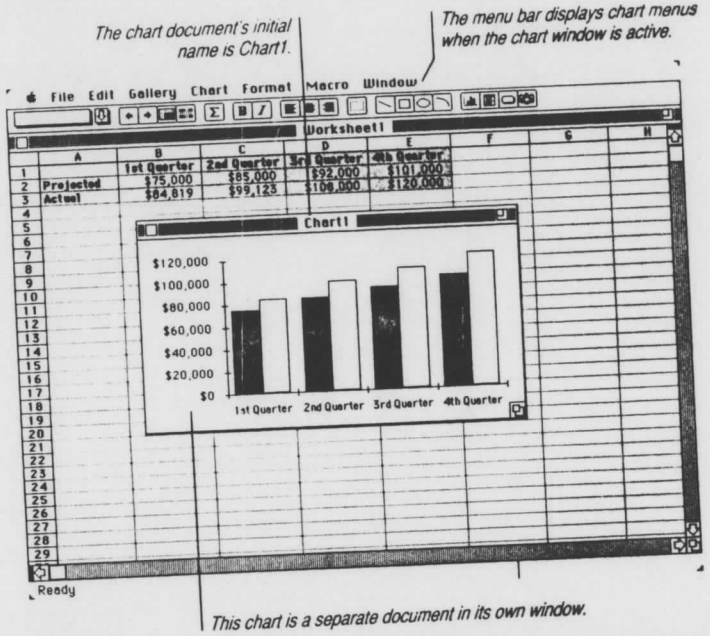
You may prefer to create the chart in a separate document if you want to be able to open and print the chart separately or if you don't want the chart taking up space on the screen as you work on the worksheet. Like an embedded chart, a chart document is linked to the source worksheet, so the chart is updated when you update the source data.

The following illustrations show a new chart and the worksheet data used to create the chart. Note that Microsoft Excel uses the text entries in the first row of the selection on the worksheet as the category names on the chart, and that each row of worksheet values is indicated on the chart by a different pattern. A group of related numeric values—such as the row of projected values or the row of actual values in the following illustration—is called a *chart data series*. Markers with the same pattern represent one data series.

The following illustration shows a chart embedded on a worksheet:


Each marker represents one number from the worksheet selection.
The chart was created from this data on the worksheet.
Category names are taken from worksheet data.
Markers with the same pattern represent one data series.
Formats in the worksheet selection (such as those for numbers) determine the initial chart formats.

The following illustration shows a chart created as a separate document in its own window:


The chart document's initial name is Chart1.
The menu bar displays chart menus when the chart window is active.
This chart is a separate document in its own window.

NOTE If you want to edit an embedded chart—for example, to change the chart type or to format or customize the chart—or if you want to save the embedded chart as a separate chart file, you must double-click the embedded chart to open it in a chart window. When you open an embedded chart, the chart menu bar replaces the worksheet menu bar and you can edit and format the chart just as you would any chart document. For more information on editing and formatting a chart, see Chapter 12, "Editing a Chart" and Chapter 13, "Formatting a Chart."

Online Help also provides information on creating a new chart. To display online Help, choose the Window Help command. If you are using system software version 7.0 and the Help command does not appear on the Window menu, display Help by pointing to the Help menu icon and choosing the Microsoft Excel Help command. For information on a specific command, select the Commands topic. For information on using online Help, see "Using Help" in Chapter 1.

Creating a new chart embedded on a worksheet

You can embed a new chart on a worksheet using the chart tool ( ) on the tool bar.

1. Select the range of worksheet cells that you want to chart, including the data and any worksheet column or row labels you want used on the chart.

   Do not select empty cells outside the rows and columns you want charted.

2. Click the chart tool.

   The mouse pointer changes to a cross hair.

3. Position the pointer where you want one corner of the chart located.

4. Drag until the chart rectangle is the size and shape you want the chart to be.

   If you want your chart to be plotted in a perfect square, hold down SHIFT while you drag.

   To align the chart to the cell grid, hold down COMMAND while you drag.

When you release the mouse button, Microsoft Excel creates the chart in the preferred chart format and displays it in the rectangle you drew.

If the worksheet selection can be interpreted in more than one way, Microsoft Excel displays a dialog box asking you for more information. For information on this dialog box, see "Specifying the Contents of the First Row or Column," later in this section.

NOTE To embed a chart that was created as a separate document, activate the chart window and choose Edit Copy. On the worksheet, select where you want to place the embedded chart and choose Edit Paste.

Creating a new chart as a separate document

1. Select the range of worksheet cells that contain the data you want to plot, including any worksheet column and row labels you want used on the chart.

   Do not select empty cells outside the rows and columns you want charted.

2. Choose File New.

3. In the list, select the Chart option.

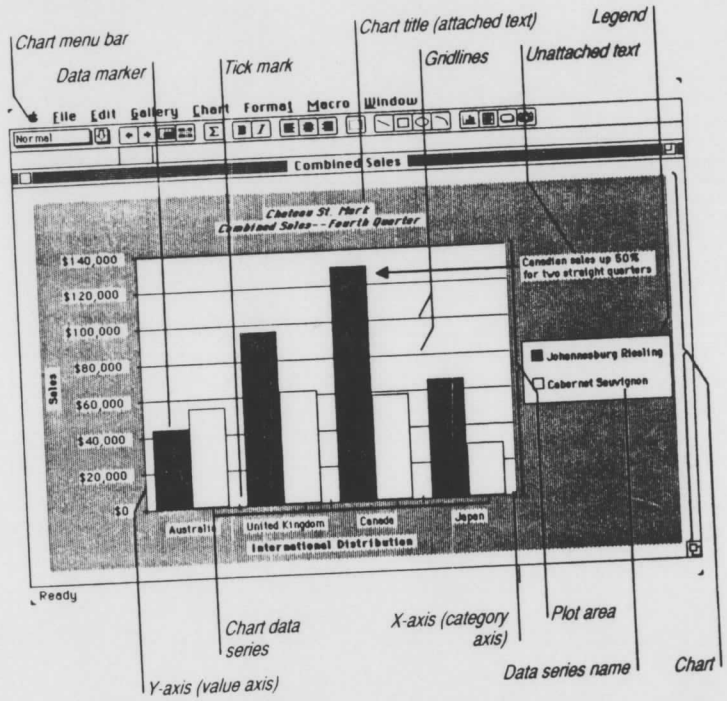
4. Choose OK.

Microsoft Excel creates the chart document in the preferred chart format and displays it in a new window. However, if the selection can be interpreted in more than one way, Microsoft Excel displays a dialog box asking you for more information. For information on this dialog box, see "Specifying the Contents of the First Row or Column," later in this section.

NOTE You can also create the chart by selecting the cells you want to plot and pressing F11.

Understanding the Parts of a Chart

The following illustration shows the parts of a chart:



- **Chart** The entire area inside the chart window, including all elements of the chart, such as labels, axes, or markers.
- **Chart menu bar** The bar that displays the names of the menus for charts when a chart window is active.
- **Data marker** A bar (in column and bar charts), shape (in area and pie charts), or dot or symbol (in line and scatter charts) that marks a single data point or value. Related markers in a chart make up a chart data series.

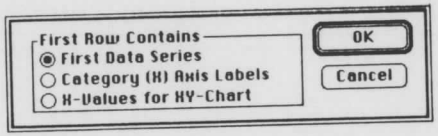
- **Chart data series** A group of related values, such as all the data values in a single row of the worksheet selection. A chart can have one or more data series. In the illustration, there are two data series: one for Johannesburg Riesling and one for Cabernet Sauvignon. Markers for a chart data series are usually distinguished by the same pattern, color, or symbol. In a chart with a single data series, such as a pie chart, markers may vary in pattern, color, or symbol.
- **Series formula (not shown)** A formula describing a chart data series. The formula includes a reference to the cell that contains the data series name, references to worksheet cells that contain the categories and values plotted in the chart, and the plot order of the series. A series formula can also contain the actual data used to plot the chart. For information on editing a series formula, including controlling the plot order, see "Adding, Editing, and Deleting Chart Data" in Chapter 12 and the SERIES function in the *Microsoft Excel Function Reference*.
- **Axis** A line that serves as a major reference for plotting data in a chart. Usually, on two-dimensional charts, the categories of data are plotted along the horizontal axis (x-axis), while the data values are plotted along the vertical axis (y-axis). On three-dimensional charts the vertical axis is the z-axis; category names are plotted along the x-axis, series names are plotted along the y-axis, and the values are plotted along the z-axis. For an example of axes in a 3-D chart, see "More About Creating a New Chart," later in this section.

  Bar charts reverse the horizontal and vertical axes, with the values plotted along the horizontal axis and the categories plotted along the vertical axis. An xy (scatter) chart plots values along both the horizontal and vertical axes. A pie chart has no axes.
- **Tick mark** A small line that intersects an axis and marks off a category, scale, or chart data series. A tick mark label is attached text that identifies a tick mark.
- **Plot area** The area in which Microsoft Excel plots your data. It includes the axes and all markers that represent data points.
- **Gridlines** Optional lines that extend from the tickmarks on an axis across the plot area to make it easier to view data values.
- **Chart text** Text that describes data or objects in a chart. *Attached text* is any label linked to a chart object such as an axis or a data marker; such text moves with the object if it is repositioned but cannot be moved independently of the chart object. *Unattached text* is text you add by just typing whenever the chart is active and then pressing ENTER. You can move unattached text anywhere on the chart.
- **Legend** A key that identifies the patterns, colors, or symbols associated with the markers of a chart data series, and shows the data series name that corresponds to each marker.

Specifying the Contents of the First Row or Column

If there are no apparent category names in the selection, Microsoft Excel displays a dialog box asking how to interpret the data in the first row or column.

For example, if you are creating a chart and the worksheet selection is two rows of numbers, Microsoft Excel needs to know whether both rows of numbers are separate data series or whether the first row contains x-axis category names or x-values.



To plot the data in the first row or column as the first series of values along the y-axis (or z-axis in a 3-D chart), select the First Data Series option and choose OK.

To plot the data in the first row or column as names of categories along the x-axis, select the Category (X) Axis Labels option and choose OK.

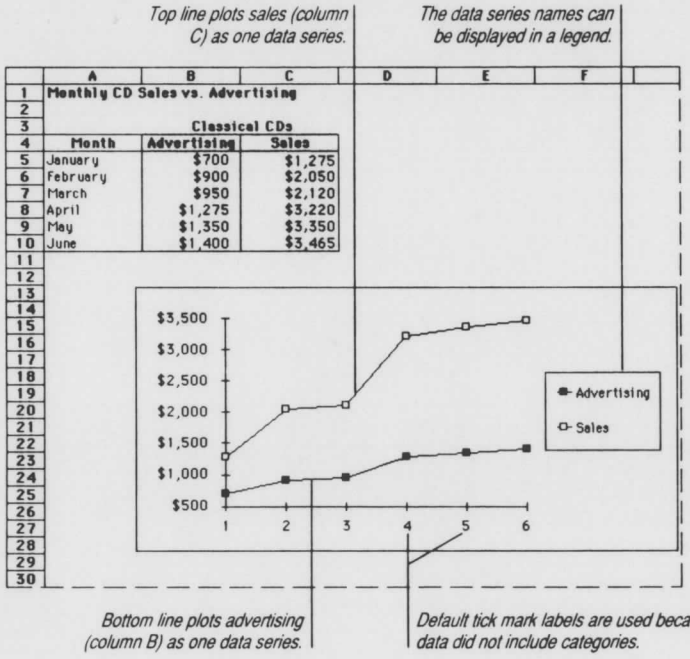
To plot the data as xy coordinates (that is, to plot the values in the first row or column along the x-axis and to plot the values in other rows or columns along the y-axis), select the X-Values For XY-Chart option and choose OK. Microsoft Excel plots the data as an xy (scatter) chart even if another type of chart is defined as the preferred chart format. For more information on the preferred chart format, see the following section, "Changing the Chart Type or Format."

Plotting XY Coordinates on an XY (Scatter) Chart

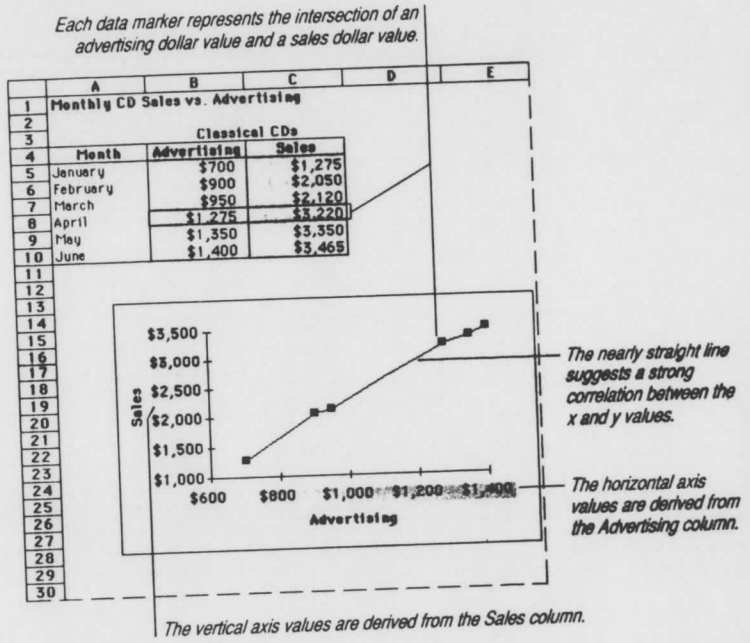
XY (scatter) charts are useful for showing how several chart data series are related to each other, or for plotting two groups of numbers as one series of xy coordinates. In an xy chart, Microsoft Excel uses numeric values along both axes, as opposed to values along the vertical axis and categories along the horizontal axis. This kind of chart is typically used to analyze data to see if one set of values is dependent on or affects another set of values.

The following illustrations show how plotting a music store's advertising and sales data as two different series differs from plotting them as one series of xy coordinates on an xy chart.

The first illustration shows the result of plotting advertising dollars and sales of classical music compact disks (CDs) as separate chart data series. The selection used to create this chart is B4:C10. In the resulting chart, it is not clear if there is a numeric correlation between advertising dollars spent and sales of classical music CDs, although you can see some correspondence.


Top line plots sales (column C) as one data series.
The data series names can be displayed in a legend.
Monthly CD Sales vs. Advertising
Classical CDs
Month | Advertising | Sales
January | $700 | $1,275
February | $900 | $2,050
March | $950 | $2,120
April | $1,275 | $3,220
May | $1,350 | $3,350
June | $1,400 | $3,465
$3,500
$3,000
$2,500
$2,000
$1,500
$1,000
$500
1 2 3 4 5 6
Advertising
Sales
Bottom line plots advertising (column B) as one data series.
Default tick mark labels are used because data did not include categories.

The following chart plots the same data as xy coordinates so Microsoft Excel plots only one data series consisting of xy coordinates. You can see an apparent numeric correlation between advertising and sales for classical CDs. The nearly straight line connecting the data markers suggests that there may be a high degree of correlation between advertising and sales. Each data marker represents the intersection of an advertising dollar value (x-value) and a sales dollar value (y-value).


Each data marker represents the intersection of an advertising dollar value and a sales dollar value.
Monthly CD Sales vs. Advertising
Classical CDs
Month | Advertising | Sales
January | $700 | $1,275
February | $900 | $2,050
March | $950 | $2,120
April | $1,275 | $3,220
May | $1,350 | $3,350
June | $1,400 | $3,465
$3,500
$3,000
$2,500
$2,000
$1,500
$1,000
Sales
$600 $800 $1,000 $1,200 $1,400
Advertising
The nearly straight line suggests a strong correlation between the x and y values.
The horizontal axis values are derived from the Advertising column.
The vertical axis values are derived from the Sales column.

Plotting xy coordinates on an xy (scatter) chart

To do this procedure, you must be using full menus.

1 Select the range of worksheet cells that contain the data you want to plot.

For xy charts, the selection should include a row or column of x-values and a row or column of y-values, and it should not contain text or dates in both the first row and column.

2 Choose File New.

3 In the list, select the Chart option.

4 Choose OK.

Microsoft Excel displays a dialog box so you can choose to plot the data as xy coordinates or as separate chart data series. If a dialog box does not appear and the chart is plotted right away, your selection may not be correct and you should repeat steps 1 through 4.

5 Select the X-Values For XY-Chart option.

Microsoft Excel creates an xy (scatter) chart using the values in the first row or column of the selection as x-values, and the values in the other rows or columns as y-values.

If you want to plot the data as separate chart data series instead of xy coordinates, select the First Data Series option, and Microsoft Excel automatically generates the x-values 1, 2, 3, and so on. For more information, see "Specifying the Contents of the First Row or Column," earlier in this section.

6 Choose OK.

You can also use the chart tool to create the xy chart.

MORE ABOUT

More About Creating a New Chart

Guidelines

How Microsoft Excel Plots a Chart Microsoft Excel defines a chart data series and plots worksheet data based on the shape and contents of the worksheet selection. First Microsoft Excel determines whether the selection includes category names and series names. If the upper-left cell of the worksheet selection is blank or if the first row and column contain text or dates, Microsoft Excel uses the first row and the first column for the series names and category names.

MORE ABOUT

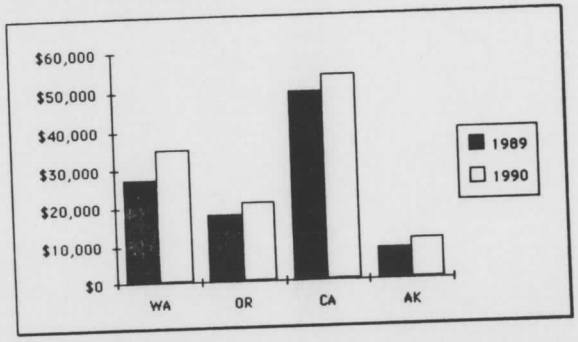
Whether the row or column is used for series names or category names depends on the shape of the selection; Microsoft Excel always assumes that you want fewer data series than categories, or, for xy (scatter) charts, fewer data series than data points. If the worksheet selection—excluding the category names and series names—has more rows than columns (is taller than wide), Microsoft Excel plots each column as a chart data series.

For example, in the following illustration, Microsoft Excel assumes that the first row contains the data series names and the first column contains the category names:

	A	B	C
1		1989	1990
2	WA	$27,350	$35,212
3	OR	$17,892	$20,950
4	CA	$49,781	$53,647
5	AK	$8,563	$10,898

Data series names

Category names



(To create this chart, you would select A1:C5, choose File New, and select the Chart option. You add the legend by choosing Chart Add Legend.)

MORE ABOUT

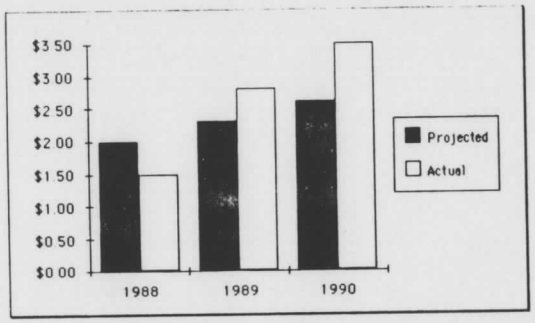
If the worksheet selection has more columns than rows (is wider than tall) or has an equal number of columns and rows, Microsoft Excel plots each row as a chart data series and uses the first row as the category names and the first column as the data series names.

For example, in the following illustration, Microsoft Excel assumes that the first row contains category names and the first column contains the data series names:

	A	B	C	D
1		1988	1989	1990
2	Projected	$2.0	$2.3	$2.6
3	Actual	$1.5	$2.8	$3.5

Category names

Data series names



(To create this chart, you would select cells A1:D3, choose File New, and select the Chart option. You add the legend by choosing Chart Add Legend.)

If the upper-left cell of the worksheet selection is not blank, Microsoft Excel looks for text or dates in the first row and in the first column. Microsoft Excel uses the text or dates as the category names or series names, again depending on the shape of the worksheet selection.

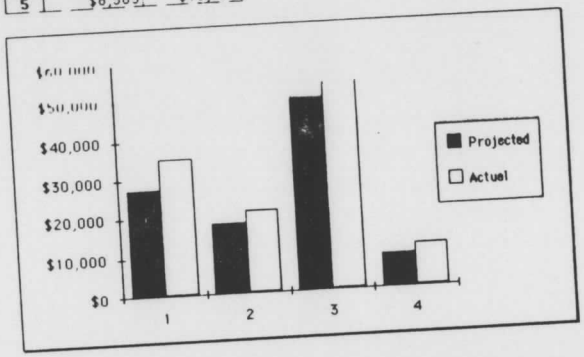
The rules used for plotting selections by shape are the same whether or not the upper-left cell of the worksheet selection is blank. For example, if only the first row contains text values and the worksheet selection has more rows than columns (is taller than wide), the first row is used as the chart data series names, and each column is plotted as a data series.

MORE ABOUT

In the following illustration, no category names are available in the first column, so before plotting the chart, Microsoft Excel displays a dialog box asking if the first column contains the first data series, category names, or x-values for an xy chart. If you specified the first data series, Microsoft Excel would create the chart shown in the illustration:

	A	B
1	Projected	Actual
2	$27,350	$35,212
3	$17,892	$20,950
4	$49,781	$53,647
5	$8,563	$10,898

Data series names



(To create this chart, you would select cells A1:B5, choose File New, and select the Chart option. When the dialog box appears, select the First Data Series option. You add the legend by choosing Chart Add Legend.)

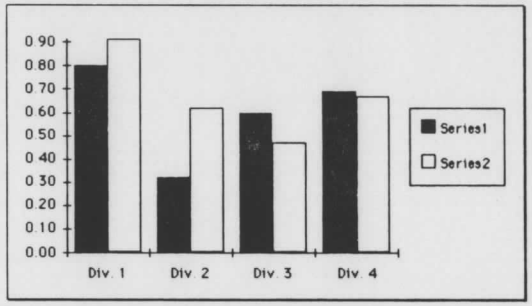
Alternately, if only the first column contains text or dates and the worksheet selection has more rows than columns (is again taller than wide), the first column is used as the category names and each column is again plotted as a chart data series.

MORE ABOUT

For example, in the following chart, no series names are available in the first row, so the legend contains the names Series1 and Series2. (In general, Microsoft Excel assigns the names Series1, Series2, Series3, and so on.)

Category names

	A	B	C
1	Div. 1	0.80	0.91
2	Div. 2	0.32	0.62
3	Div. 3	0.60	0.47
4	Div. 4	0.69	0.67



(To create this chart, you would select cells A1:C4, choose File New, and select the Chart option. You add the legend by choosing Chart Add Legend.)

Understanding a Chart Data Series and a Series Formula Each set of related points on a chart (for example, the data points plotted from a column of a worksheet selection) is a chart data series. A chart data series is described within Microsoft Excel by a *series formula*. Understanding a series formula is useful for:

- Editing a series formula to change a data series name in a chart legend or to control how data series are plotted.
- Building a series formula to add a chart data series to an existing chart.
- Deleting a chart data series from a chart by deleting its series formula.

If you want to manipulate individual data series in a chart, you should learn about working with and editing the series formula. For information on editing a series formula, including controlling the plot order, see "Adding, Editing, and Deleting Chart Data" in Chapter 12 and the SERIES function in the *Microsoft Excel Function Reference*.

Plotting a Multiple Selection You will need to plot a multiple selection when you have blank rows or columns on a worksheet between the rows or columns you want to plot, when you want to plot a collapsed outline without plotting the hidden rows or columns, or when you want to plot only part of a row or column.

MORE ABOUT

When you plot a multiple selection, Microsoft Excel tries to compress the multiple selection into a single range selection. (Microsoft Excel doesn't actually remove cells or change your worksheet; the compression process is used only to plot the chart.) If the compression is successful, Microsoft Excel applies the normal rules for plotting a chart as explained earlier in this section.

For example, suppose you have a worksheet showing the inventory of four products left over at the end of each month and you want to plot only the values for products 1 and 3 at the end of each quarter. You can use a multiple selection to plot only the values you want as shown in the following illustration. When you plot the chart, Microsoft Excel treats the multiple selection exactly as if you had plotted the multiple selection as a single selection:

	A	B	C	D	E
1		Product 1	Product 2	Product 3	Product 4
2	January	3	44	1	45
3	February	48	37	1	14
4	March	14	22	8	9
5	April	8	30	7	33
6	May	33	33	17	17
7	June	15	36	32	3
8	July	25	25	32	11
9	August	37	34	5	17
10	September	47	37	49	31
11	October	48	8	39	3
12	November	2	0	15	12
13	December	7	10	0	38
14					

When plotting a chart, Microsoft Excel treats a multiple selection...

...as if it were a single rectangular selection.

	Product 1	Product 3
March	14	8
June	15	32
September	47	49
December	7	0

In general, your multiple selection—excluding series names and categories—should be rectangles that Microsoft Excel can easily compress into a single rectangular selection. The resulting compressed selection is the original multiple selection after "removing" entire rows and columns between the individual areas. If removing rows or columns also would remove any cells from your original selection, Microsoft Excel does not compress the selection.

If the multiple selection cannot be compressed into a single rectangular selection, Microsoft Excel checks the upper-left cell of the first range selected. If this cell contains something other than a date or text, Microsoft Excel assumes that the multiple selection does not include series names or category names. If this cell does contain a date or text, Microsoft Excel checks the other cells in the multiple selection and attempts to determine category names and series names.

MORE ABOUT

As with a single range selection, Microsoft Excel organizes the values in a multiple selection into chart data series by determining whether there are fewer columns or rows in the first range selected. If there are fewer columns, Microsoft Excel plots each column as a separate data series. If there are fewer rows or an equal number of rows and columns, Microsoft Excel plots each row as a separate data series.

To make a multiple selection, drag through the first selection and then hold down the COMMAND key while you drag through each additional selection. You can also make a multiple selection with just the keyboard. For information on making a multiple selection with the keyboard, see "Selecting Cells and Moving Around the Worksheet" in Chapter 3.

If the selection you want to plot includes rows or columns that are hidden or collapsed in an outline and you don't want to plot the data in the hidden or collapsed cells, click the select visible cells button in the tool bar after you select the area you want to plot, and then create the chart.

Controlling How Microsoft Excel Plots Chart Data Series Normally Microsoft Excel uses the shape of the worksheet selection to determine whether rows or columns form the data series. However, you can control whether Microsoft Excel plots the worksheet rows or columns as chart data series. In other words, you can reverse Microsoft Excel's default plotting.

Microsoft Excel assumes you want fewer data series than categories. So, if the worksheet selection has more rows than columns, Microsoft Excel plots each column as a separate data series. Similarly, if the worksheet selection has more columns than rows, Microsoft Excel plots each row as a separate data series.

You can change the plotting using one of two methods:

- The easiest way is to create your chart and then choose the Chart Edit Series command and specify different ranges of cells to use for your chart values. Use this method if the chart has already been plotted. For more information, see "Adding, Editing, and Deleting Chart Data" in Chapter 12.
- If you want to control how the data series are plotted when you first create the chart, you can choose the Edit Copy and Edit Paste Special commands to copy the data and paste it into the chart the way you want. Using this method, you can control whether the rows or columns of data are treated as chart data series, and you can specify whether a particular row or column contains data series names or category names.

  To control whether rows or columns become data series in a chart, select the data you want to plot—including the category names and chart data series names, if any—and choose Edit Copy. (If you're copying a multiple selection, it must be compatible with Microsoft Excel outlining. That is, removing entire rows or columns between the individual areas of the selection must not affect any cells in the original selection.) Then create a blank chart document by choosing the File New command and selecting the Chart option. If you then choose the Edit Paste Special command, Microsoft Excel displays a dialog box where you can specify whether data series values are in rows or columns.

MORE ABOUT

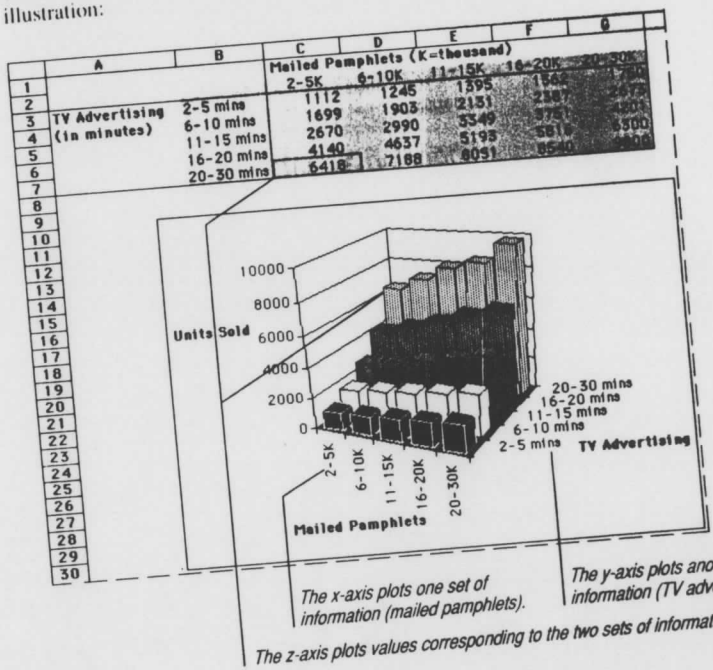
You can also turn check boxes on or off to specify whether the selection includes category names or data series names.

If your selection does not include category names and you want to plot the data as xy coordinates on an xy (scatter) chart, turn on the Categories (X-Labels) In First Column or Categories (X-Labels) In First Row check box, whichever is displayed.

If you have already plotted a chart and want to replace existing categories with new information, turn on the Replace Existing Categories check box.

Plotting a Multicategory 3-D Chart XY (scatter) charts can give you a two-dimensional visual interpretation of how x and y values are related (that is, y as a function of x). Similarly, 3-D column charts can give you a visual interpretation of how two types of information and one set of values are related.

For example, suppose a company produces a new product and advertises it with television commercials and pamphlets mailed to customers. The company tracks sales of the product over several months. You can plot a 3-D column chart to see how the number of minutes of television advertising and the number of pamphlets sent are both related to the number of units sold, as shown in the following illustration:



The x-axis plots one set of information (mailed pamphlets).

The y-axis plots another set of information (TV advertising).

The z-axis plots values corresponding to the two sets of information.

Changing the Chart Type or Format

Microsoft Excel offers 11 chart types and a gallery of built-in formats for each of the chart types. Each of the available chart types is listed on the Gallery menu. If a new chart is not created in the type and format you want, you can use the Gallery menu commands to change to the chart type and format you want.

IMPORTANT Changing the chart type or format with the Gallery menu commands overrides any custom formatting, such as patterns and gridline settings, that you have applied, so you should always choose the gallery option you want before you customize the chart. If you have already customized a chart and want to change the chart type but retain your custom formats, you can do so with the Format Main Chart command, and any custom formats that apply to the new chart type will be preserved.

For information on	See
Formatting a chart	Chapter 13, "Formatting a Chart"

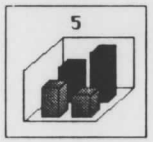
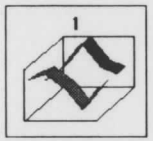
Online Help also provides information on changing the chart type or format. To display online Help, choose the Window Help command. If you are using system software version 7.0 and the Help command does not appear on the Window menu, display Help by pointing to the Help menu icon and choosing the Microsoft Excel Help command. For information on a specific command, select the Commands topic. For information on using online Help, see "Using Help" in Chapter 1.

Choosing a Chart Type

The following table provides a summary of chart types and some of the most appropriate uses of each.

Chart type	Uses
Area	Shows the relative importance of values over a period of time; similar to a line chart, but emphasizes the amount of change (magnitude of values) rather than the rate of change.
Bar	Shows individual figures at a specific time or draws comparisons between items but not to a whole; similar to a column chart but categories are organized vertically instead of horizontally, placing less emphasis on time flow.

Chart type	Uses
Column	Shows variation over a period of time or draws comparisons between items but not to a whole; horizontal orientation suggests time flow more than a bar chart.
Line	Shows trends or changes in data over a period of time; similar to an area chart, but emphasizes time flow and rate of change, rather than amount of change.
Pie	Shows the relationship or proportions of parts to a whole (always contains just one chart data series); good for highlighting a significant element.
XY (Scatter)	Shows the relationship or degree of relationship between the numeric values in different groups of data; useful for finding patterns or trends and for determining whether variables are dependent upon or affect one another.
Combination	Shows related data that is measured in different units (up to four axes can be used in a combination chart); combines different data to show comparisons and relationships that might not otherwise be recognized. (Full menus only)

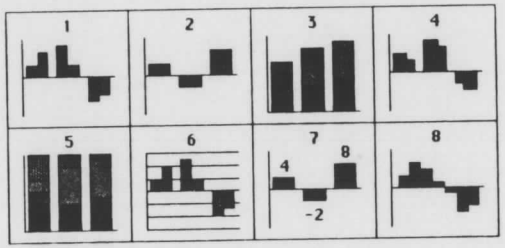
Chart type	Uses
3-D Area	Shows a 3-D view of an area chart; emphasizes the sum of plotted values, and separates chart data series into distinct rows to show differences between the data series.
3-D Column 	Shows a 3-D view of a column chart; emphasizes comparison of data points along two axes—a category axis and a chart data series axis—so you can compare data within a data series more easily and still view data by category.
3-D Line 	Shows lines in a line chart as 3-D ribbons; makes individual lines easier to view, particularly when they cross, while still showing all chart data series in one chart for comparison.
3-D Pie	Shows a pie chart with height to the slices; places additional emphasis on data values that are in front.

Changing the Chart Type with the Gallery Menu Commands

The Gallery menu contains a command for each chart type. Microsoft Excel displays a check mark next to the current chart type. Use the Gallery commands to change chart types if:

- A new chart is not created with the chart type or format you want.
- You are experimenting with chart types for a noncustomized chart—for example, to analyze the data in several formats on the screen or to find the best chart type for the data.
- You want to start over again with a different chart type and clear your custom formats.

When you select a chart type from the Gallery menu, Microsoft Excel displays a gallery of different chart formats for that type. For example, the following illustration shows the formats available for the Column chart type:



For more information about each of the gallery choices available for each chart type, see "More About Changing the Chart Type or Format," later in this section.

You are not limited to the chart formats displayed in the gallery; the gallery choices are essentially formatting shortcuts. They automatically apply formatting and incorporate elements that you could also apply or add individually. Once you have selected the chart type and format you want, you can customize any chart to suit your needs. For information on formatting a chart, see Chapter 13, "Formatting a Chart."

Changing chart types or formats with the Gallery commands

Use the Gallery commands to format a chart quickly. First select the chart type and format that most closely resembles the chart you want to create and then customize the chart if you need to. You may not need to customize the chart if one of the built-in chart formats matches the chart format you want to create.

1. Activate the chart window. If the chart was created on a worksheet with the chart tool on the tool bar, double-click the chart to display the chart in a chart window.
2. Select the Gallery menu.

   The check mark on the menu indicates the type of chart in the active chart window.
3. From the Gallery menu, choose the chart type you want.

   A dialog box displays a gallery of different formats for that chart type. To display the gallery for the next chart type on the Gallery menu, choose the Next button. To display the gallery for the previous chart type on the Gallery menu, choose the Previous button.
4. Select the format you want by clicking it or typing the number of the format.
5. Choose OK.

Changing the Chart Type of a Customized Chart

If you have already added custom formatting to a chart, you can change the chart type and retain any formats appropriate for the new chart type with the Format Main Chart command. For information on other formatting options available in the Format Main Chart dialog box, see "Formatting Chart Data Markers" in Chapter 13.

Changing the chart type and retaining your custom formats

1 Choose Format Main Chart.

2 In the Main Chart Type box, select the chart type you want.

If more than one format is available for the type of chart you want, you can also select a format under Data View.

3 Choose OK.

Applying and Setting the Preferred Chart Format

The preferred chart format is the default chart type and format that Microsoft Excel applies when you create a new chart. Initially, the chart type is the column chart, and the format is set to the first format in the Gallery Column dialog box.

With the Gallery Preferred command, you can choose the preferred chart format at any time to quickly return a chart to its initial chart type and format. You can also set the preferred chart format to match the active chart, so that Microsoft Excel applies that chart type and format whenever you choose Gallery Preferred or create a new chart.

The preferred chart format can be one of the built-in gallery formats or a custom format you've created. The preferred chart format you set remains in effect until you quit Microsoft Excel. If you specify a preferred chart format other than the first format in the Gallery Column dialog box and you want to save that preferred chart setting, you can do so by saving the workspace with the File Save Workspace command or by creating a Microsoft Excel template. For information on saving and opening a workspace file, see "Setting Up a Workspace" in Chapter 16. For information on templates, see "Creating and Using a Document Template" in Chapter 16.

Changing a chart back to the preferred format

To do this procedure, you must be using full menus.

▶ Choose Gallery Preferred.

Changing the preferred chart format

To do this procedure, you must be using full menus.

1 Create a chart that is formatted with the chart type and formats you want used for all your new charts.

You can apply whatever custom formatting you want.

2 Choose Gallery Set Preferred.

Microsoft Excel saves all formatting details of the active chart as the preferred chart format.

Changing the preferred chart format using a blank chart

If you do not already have a chart formatted with the type and formats you want, you can still choose a chart type for a blank chart and then define that type as the preferred type.

To do this procedure, you must be using full menus.

1 Select a blank cell on your worksheet.

2 Choose File New.

3 In the list, select the Chart option.

Microsoft Excel displays a blank chart window.

4 Choose the Gallery command corresponding to the chart type you want to define as preferred.

A dialog box displays a gallery of different formats for that chart type. To display the gallery for the next chart type on the Gallery menu, choose the Next button. To display the gallery for the previous chart type on the Gallery menu, choose the Previous button.

5 Select the format you want by clicking it or typing the number of the format.

6 Choose OK.

7 Choose Gallery Set Preferred.

8 Close the blank chart window.

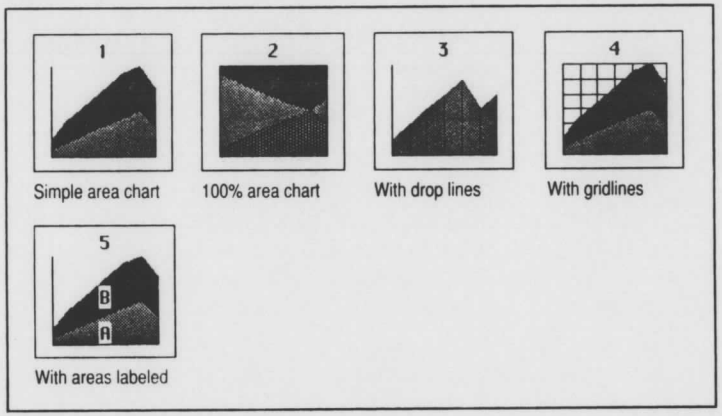
You do not need to save changes to the blank chart when you close it.

MORE ABOUT

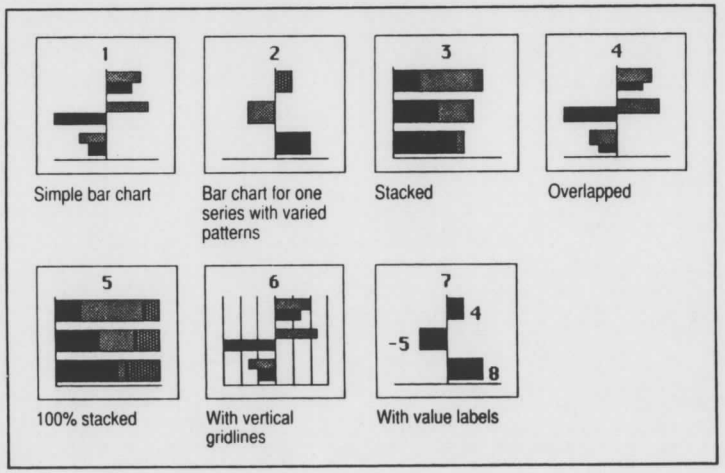
More About Changing the Chart Type or Format

Guidelines

Gallery Area The Gallery Area command offers the following area chart formats:

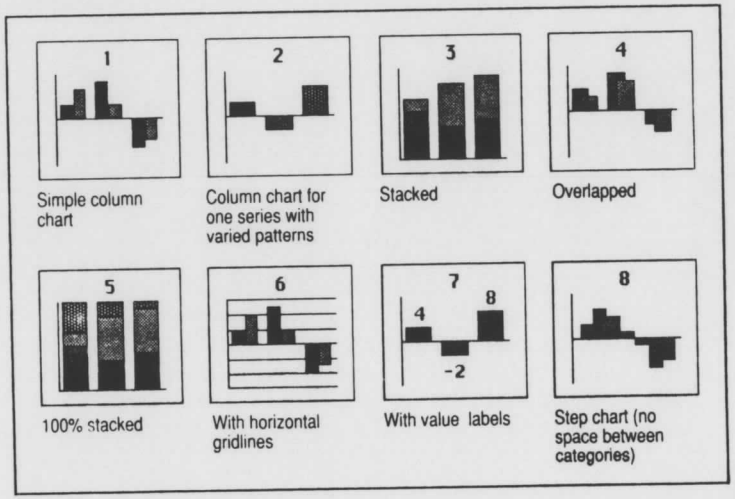


Gallery Bar The Gallery Bar command offers the following bar chart formats:

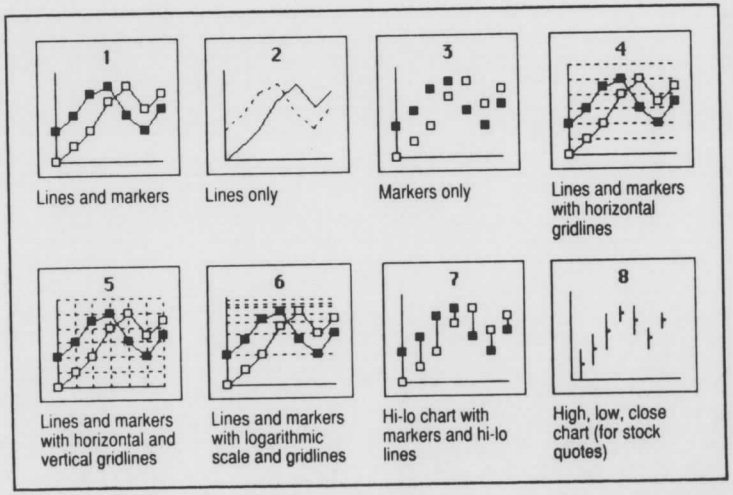


MORE ABOUT

Gallery Column The Gallery Column command offers the following column chart formats:

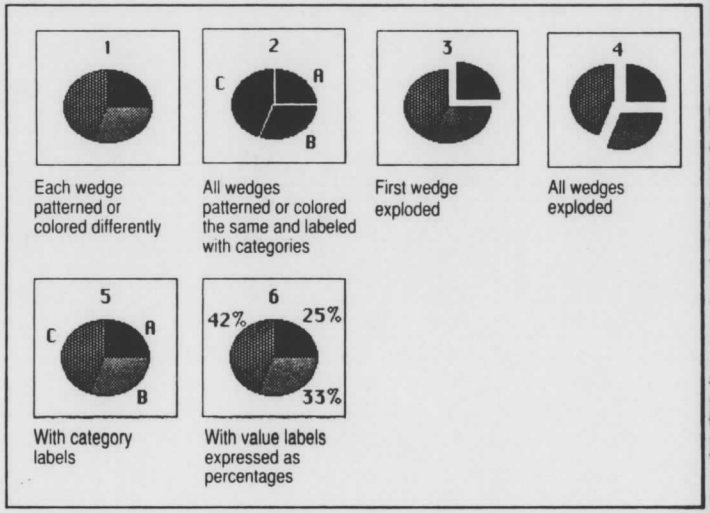


Gallery Line The Gallery Line command offers the following line chart formats:



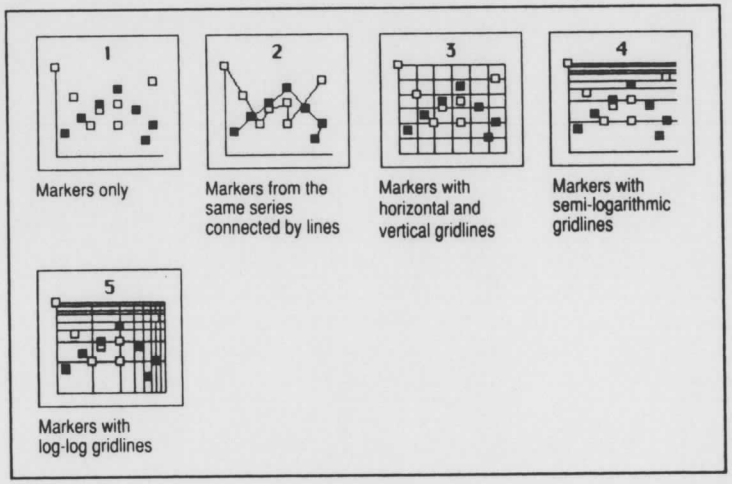
MORE ABOUT

Gallery Pie The Gallery Pie command offers the following pie chart formats:



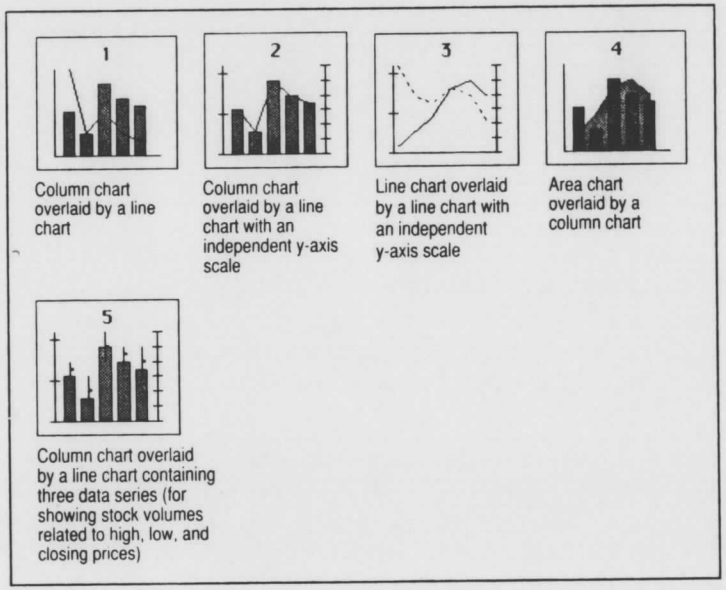
MORE ABOUT

Gallery XY (Scatter) In an xy (scatter) chart, the x-axis must be numerical, and data is plotted as xy coordinates. Microsoft Excel calculates the scale and tick mark labels for the x-axis, just as it does for the y-axis. The Gallery XY (Scatter) command offers the following xy, or scatter, chart formats:



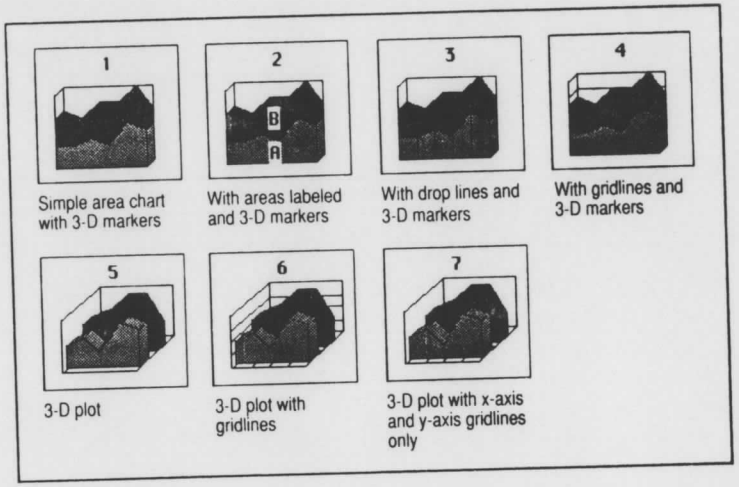
MORE ABOUT

Gallery Combination Use the Gallery Combination command when you want to use a different chart type or axis scale for some of the chart data series in the same chart. Combination charts are useful for overlaying one data series over another to show how closely the data series match. For example, a combination chart could show actual figures versus projected figures. For information on creating a combination chart, see the following section, "Creating an Overlay Chart."


1
Column chart overlaid by a line chart
2
Column chart overlaid by a line chart with an independent y-axis scale
3
Line chart overlaid by a line chart with an independent y-axis scale
4
Area chart overlaid by a column chart
5
Column chart overlaid by a line chart containing three data series (for showing stock volumes related to high, low, and closing prices)

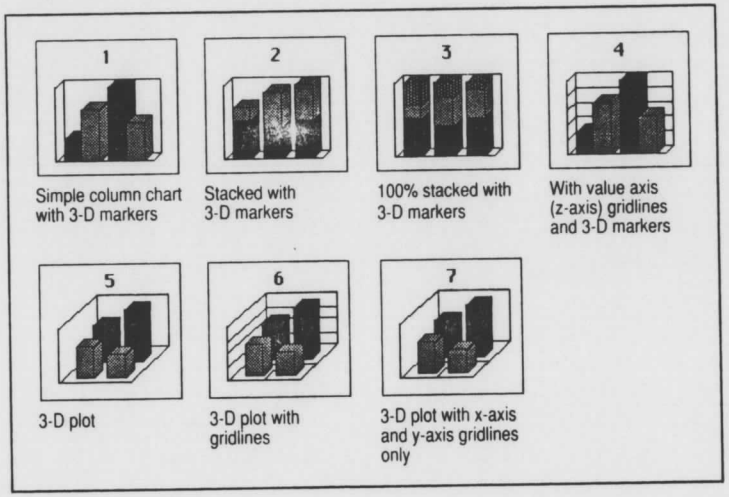
MORE ABOUT

Gallery 3-D Area The Gallery 3-D Area command offers the following 3-D area chart formats:

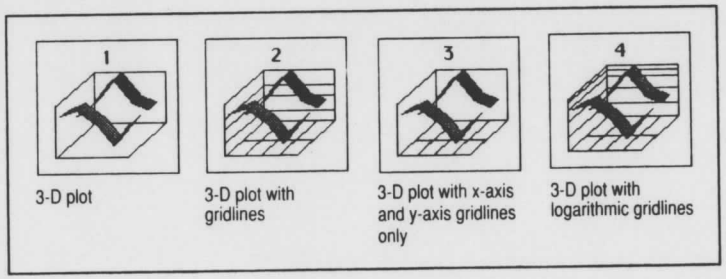


MORE ABOUT

Gallery 3-D Column The Gallery 3-D Column command offers the following 3-D column chart formats:

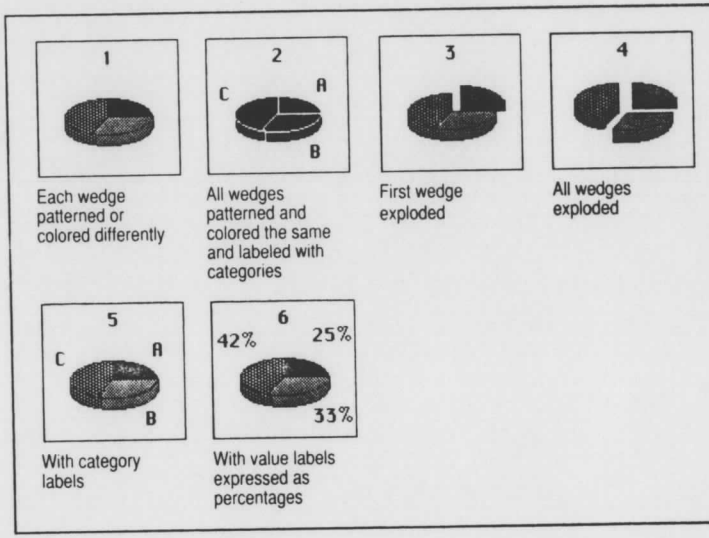


Gallery 3-D Line The Gallery 3-D Line command offers the following 3-D line chart formats:



MORE ABOUT

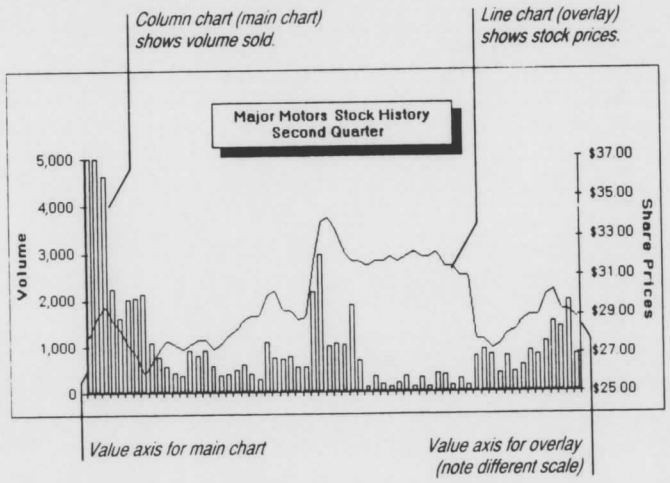
Gallery 3-D Pie The Gallery 3-D Pie command offers the following 3-D pie chart formats:



Creating an Overlay Chart

An *overlay chart* is a second chart plotted on top of the main chart in the same chart window. Use an overlay chart when you want at least two chart data series plotted in the same chart but you want one or more of the data series to use a different axis scale or chart type than the other data series. A chart that contains an overlay chart is called a *combination* chart. Combination charts are useful for comparing two different kinds of data or juxtaposing data series to show correlations more clearly.

For example, if you were analyzing a company's stock performance, you might use a combination chart to show the relationship between share prices and volume, as shown in the following illustration:



For information on	See
Adding or formatting axes, labels, gridlines, or data markers for an overlay chart	Chapter 13, "Formatting a Chart"

Online Help also provides information on creating an overlay chart. To display online Help, choose the Window Help command. If you are using system software version 7.0 and the Help command does not appear on the Window menu, display Help by pointing to the Help menu icon and choosing the Microsoft Excel Help command. For information on a specific command, select the Commands topic. For information on using online Help, see "Using Help" in Chapter 1.

Adding and Deleting an Overlay Chart

There are two ways to create an overlay chart:

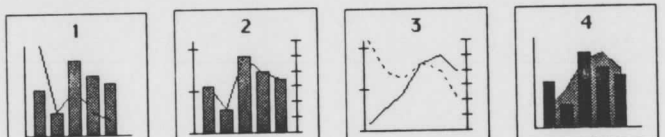
- If you've just created a new chart and haven't yet customized it, use the Gallery Combination command.
- If you've already customized the chart and want to preserve the formatting, use the Chart Add Overlay command.

When you create an overlay chart, Microsoft Excel divides the chart data series in the active chart equally between the main and overlay charts. The first group of data series is plotted in the main chart and the second group in the overlay chart. If there are an odd number of data series, Microsoft Excel puts one more data series in the main chart than in the overlay chart. For example, if there are five data series, Microsoft Excel puts the first three in the main chart and the remaining two in the overlay chart.

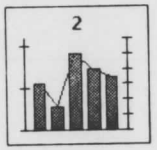
Since the chart data series for the overlay chart are taken from the main chart data series, all the data series you want in both charts should be in the main chart before you create the overlay chart. If you're creating a new chart and you plan on adding an overlay chart to it, you should select all the data series for both charts on the worksheet when you create the chart.

If you decide to add overlay chart data after you have created a combination chart, Microsoft Excel redivides the entire set of data series and places the first group of data series in the main chart and the second group in the overlay chart. For example, if a combination chart originally contained three data series, Microsoft Excel would plot the first two in the main chart and the remaining one in the overlay chart. If you then add two more data series to the chart to make a total of five data series, Microsoft Excel plots the original three data series in the main chart and plots the two added data series in the overlay chart. For information on adding chart data series, see "Adding, Editing, and Deleting Chart Data" in Chapter 12.

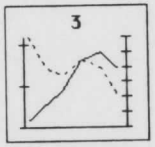
Microsoft Excel offers five built-in combination chart formats which you can select with the Gallery Combination command. You can choose one of these formats as a shortcut to creating your combination chart, and then you can customize the main chart and overlay chart to get exactly the chart you want. The format options in the gallery are:



Column chart overlaid by a line chart

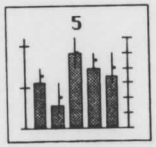


Column chart overlaid by a line chart with an independent y-axis scale



Line chart overlaid by a line chart with an independent y-axis scale

Area chart overlaid by a column chart



Column chart overlaid by a line chart containing three data series (for showing stock volumes related to high, low, and closing prices)

NOTE You cannot add an overlay chart to a 3-D chart. If a combination chart is the active chart and you select a 3-D chart type in the Format Main Chart dialog box or in the gallery, the overlay in the combination chart is deleted and all data series return to the main chart.

Changing a new chart to a combination chart

Use this procedure to add an overlay chart to a chart that you have not yet customized.

To do this procedure, you must be using full menus.

1 Choose Gallery Combination.

2 Select the format you want.

3 Choose OK.

Adding an overlay chart to a customized chart

Use the Chart Add Overlay command to add an overlay chart to an existing chart and retain your custom formatting, or if you want a different combination of overlay and main charts than those provided in the gallery. A chart can contain only one overlay chart. If the chart already has an overlay, the Chart Add Overlay command is not available.

To do this procedure, you must be using full menus.

1 Choose Chart Add Overlay.

Microsoft Excel plots a line chart as the default overlay. If you want the overlay chart to be a line chart, this completes the procedure.

2 To apply a different chart type to the overlay chart, choose Format Overlay.

3 In the Overlay Chart Type box, select the chart type you want.

If more than one format is available for the chart type you want, you can select a format under Data View.

4 Choose OK.

Changing the overlay chart type

You can change the overlay chart type after you have created it and still keep your custom formats using the Format Overlay command. For information on other formatting options available in the Format Overlay dialog box, see "Formatting Chart Data Markers" in Chapter 13.

To do this procedure, you must be using full menus.

1 Choose Format Overlay.

2 In the Overlay Chart Type box, select the chart type you want.

If more than one format is available for the chart type you want, you can select a format under Data View.

3 Choose OK.

Deleting an overlay chart

You can remove the overlay chart and return all chart data series to the main chart with the Chart Delete Overlay command. The Chart Add Overlay command changes to the Chart Delete Overlay command when a chart window with an overlay chart is active.

To do this procedure, you must be using full menus.

▶ Choose Chart Delete Overlay.

Changing Chart Data Series Distribution

You can change which chart data series appear in the main chart and which appear in the overlay chart and override Microsoft Excel's default data series distribution, by using the following techniques.

- **Specify the plot number of the first chart data series you want plotted in the overlay chart using the Format Overlay command** That series and each series with a higher plot number will appear in the overlay chart. For example, if a chart has five series and you specify series 3, then series 3, 4, and 5 appear in the overlay chart.
- **Change the plot number of the chart data series using the Chart Edit Series command** Once you change the plot number, Microsoft Excel automatically redivides the data series between the main chart and overlay chart based on their new plot order. For information on changing the plot number of a data series, see "Adding, Editing, and Deleting Chart Data" in Chapter 12.

Specifying the division of the chart data series

To do this procedure, you must be using full menus.

1. Choose Format Overlay.
2. In the First Overlay Series box, type the number of the first chart data series you want plotted in the overlay chart.

   All data series with a higher plot number will also be plotted in the overlay chart.
3. Choose OK.

MORE ABOUT

More About Creating an Overlay Chart

Guideline

Changing the Main or Overlay Chart Type with the Gallery Menu Commands To change the chart type or format of both the main chart and overlay chart, you can choose the Gallery Combination command and select a different format. The Gallery Combination command removes any custom formats you have applied so you should only use the Gallery Combination command with a noncustomized chart or on a chart that you want to return to the original gallery format. You can also change either the overlay chart or the main chart by selecting a series in the overlay or main chart and then choosing a Gallery menu command. If you choose a Gallery menu command other than Combination, you must hold down SHIFT when you choose the OK button or Microsoft Excel will remove the overlay chart and place all of its chart data series in the main chart. You cannot add an overlay chart to a 3-D chart.

Saving a Chart

If you create a chart in a separate document, you will need to save it in order to store it permanently in a file on the disk. Embedded charts created with the chart tool in the tool bar are automatically saved as part of the worksheet or macro sheet on which the chart is created. You can also save an embedded chart as a separate chart document if you first open the embedded chart. To open an embedded chart, double-click it.

As with all Microsoft Excel documents, until you save a chart, it is stored only in your computer's memory and would be lost if your computer lost power. You should save frequently so you won't lose your work in the event of a power interruption or hardware problem. It is also a good idea to save a chart before performing a major or lengthy operation so you can easily restore the chart to its previous state in case the chart does not turn out the way you intended.

There are two commands that you can use to save a chart—File Save and File Save As. Choosing the File Save command saves your chart under the same name with which it was last saved, replacing the previously saved version of the chart. If you choose the File Save As command, you can save a chart under a new name, in a different file format, in a different folder, or on another disk. With File Save As, you can also create a backup file, designate the chart as a template or add passwords to a chart that protect it from being opened or changed. Microsoft Excel does not close a chart when you save it, so you can continue to work on it after saving it.

NOTE If a chart has never been saved before, choosing either File Save or File Save As displays the File Save As dialog box so you can specify a name for the chart file.

For information on	See
Closing a chart window	"Closing a Chart Window" following in this chapter
Saving a worksheet	"Saving a Worksheet" in Chapter 3
Protecting a document with passwords	"Protecting Documents and Windows" in Chapter 16
Creating document templates	"Creating and Using a Document Template" in Chapter 16

Online Help also provides information on saving a chart. To display online Help, choose the Window Help command. If you are using system software version 7.0 and the Help command does not appear on the Window menu, display Help by pointing to the Help menu icon and choosing the Microsoft Excel Help command. For information on a specific command, select the Commands topic. For information on using online Help, see "Using Help" in Chapter 1.

Saving a new or existing chart as a new chart file

Use the following procedure if you are saving a chart for the first time or if you want to save an existing chart under a new name, in a different folder, or on a different disk.

IMPORTANT Make sure to save the supporting worksheets for a chart before you save the chart, so that the references to the worksheets are current.

1. Choose File Save As.

   If the chart has never been saved before, you can also choose File Save. Microsoft Excel displays the File Save As dialog box and proposes the current name for the chart in the Save Chart As box.

2. If you want to save the chart under a different name than the one proposed, type the name for the chart.

   For guidelines on naming files, see "More About Saving a Chart," later in this section.

3. To save the chart in a folder different from the one shown at the top of the dialog box, double-click the folder name in the list.

4. To save the chart on a different drive, click the Drive button (or the Desktop button if you're using system software version 7.0).

   For more information on changing drives and folders, see "More About Saving a Chart," later in this section.

5. Make sure that the correct file format is shown at the bottom of the dialog box.

   For a Microsoft Excel chart, the available formats are Normal and Microsoft Excel version 2.2. You can also save a chart as a template. For more information, see "Creating and Using a Document Template" in Chapter 16. If the format is not correct, change the format. For information on using different file formats, see "Exchanging Documents with Other Applications" in Chapter 8.

6. Choose the Save button.

IMPORTANT If your disk is nearly full, canceling the File Save As command after you choose the Save button may interfere with the save process. To avoid possibly losing data, do not cancel the save process after it begins.

Saving an existing chart quickly under the same name

Use the File Save command when you want to quickly save a chart that has already been saved once and you want to save it under the same name and in the same folder. Choosing File Save immediately saves the chart on the disk without first displaying the File Save As dialog box. When you choose File Save, Microsoft Excel replaces the previously saved version of the chart with the current version, unless you turn on the Create Backup File check box as described in the next procedure.

▶ Choose File Save.

IMPORTANT If your disk is nearly full, canceling the File Save command may interfere with the save process. To avoid possibly losing data, do not cancel the save process after it begins.

Creating an automatic backup file

You can set up your chart document so that each time you save the chart in the future, Microsoft Excel saves the old version of the chart in a backup file. This way you can always keep the last two versions of a chart on your disk: the version you just saved and the previous version. Microsoft Excel maintains only one backup of the chart, which is always the version previous to the current version. To create the backup file, Microsoft Excel renames the old version by preceding the name with "Backup of" before saving the current version.

1. Choose File Save As.
2. Choose the Options button.
3. Turn on the Create Backup File check box.
4. Choose OK.
5. Make any other changes to the filename, folder, or drive you want.
6. Choose the Save button.

MORE ABOUT

More About Saving a Chart

Guidelines

Naming a Chart To name a chart in Microsoft Excel, you follow the same rules that you use when naming a file for the Macintosh. The filename can be a maximum of 31 characters.

MORE ABOUT

Changing Disk Drives or Folders When you first choose File Save As, Microsoft Excel displays the name of the current drive in the upper-right corner of the File Save As dialog box and the name of the current folder in a box at the top of the dialog box. The folders and files in the current folder are listed in a box below the name of the current folder. To save the chart in a folder in the current folder, double-click the folder name in the list. The folders and files in the folder you double-clicked are then listed in the box. To save the chart in a higher-level folder above the current folder, point to the current folder name at the top of the dialog box and drag down to select the folder you want. To save the chart on another drive, choose the Drive button (or the Desktop button, if you are using system software version 7.0).

Tips

Picking Up Where You Left Off If you want to preserve your current arrangement of open windows so you can quickly restore it in the future, you can do so by using the File Save Workspace command to save a list of the currently open documents and their window size and location in a *workspace file*. To restore your workspace (open the same documents and arrange their windows in the same order), all you do is open the workspace file. For more information on saving and restoring a workspace, see "Setting Up a Workspace" in Chapter 16.

When you save the workspace, Microsoft Excel asks if you want to save changes for each open document that has been changed since it was last saved. If you choose the Yes button for a document, Microsoft Excel saves the changes on the disk and replaces the last saved version of the document, just as if you had chosen File Save for the document.

Protecting a Chart You can protect a chart's data series or formats from being accidentally altered by choosing the Chart Protect Document command and turning on the Chart check box. The chart will still be updated if its source data changes.

Viewing a Chart Document and Its Source Data at the Same Time You can choose the Window Arrange All command to see all open windows at the same time. With this feature you can see both your chart document and its source worksheet.

Closing a Chart

After you finish working in your chart and save it, you may want to close it. Closing a chart means closing the window displaying the chart. Closing a chart that is a separate document removes the chart from the workspace. An embedded chart is still displayed on the worksheet after the chart window closes.

If you close a chart document before saving your latest changes, or if you close a worksheet with unsaved changes, including changes to an embedded chart, Microsoft Excel asks if you want to save the changes. To save the changes, choose the Yes button; to ignore the changes, choose the No button; to cancel the File Close or File Close All command, choose the Cancel button.

For information on	See
Using windows	"Working with Windows" in Chapter 1
Saving your chart	"Saving a Chart" preceding in this chapter
Deleting your chart	"Deleting a Chart" in Chapter 12

Online Help also provides information on closing a chart. To display online Help, choose the Window Help command. If you are using system software version 7.0 and the Help command does not appear on the Window menu, display Help by pointing to the Help menu icon and choosing the Microsoft Excel Help command. For information on a specific command, select the Commands topic. For information on using online Help, see "Using Help" in Chapter 1.

Closing a chart window

▶ Choose File Close or click the close box at the left of the document title bar.

Closing all open documents

1 Hold down SHIFT and select the File menu.

This displays the File Close All command in place of the File Close command.

2 Choose File Close All.

Editing a Chart

Once you have created a chart, you may want to edit the chart data or the various parts of the chart, such as the legend or axes. This chapter describes how to open, edit, and delete a chart you have already created.

NOTE Unless otherwise noted, all information and procedures for working with worksheets also apply to macro sheets.

Table of Contents

Opening an Existing Chart ... 433

Selecting Items in a Chart ... 435

Adding, Editing, and Deleting Chart Data ... 438

Deleting a Chart ... 448

Opening an Existing Chart

To open a chart you created as a separate document, use the File Open command—the same command you use to open worksheets and macro sheets. When you open a chart, Microsoft Excel displays it in its own window.

You can also open a chart that is embedded on a worksheet into its own window by double-clicking the embedded chart. Microsoft Excel opens the chart in its own window for editing.

NOTE If the worksheet associated with the chart has been updated since you last saved the chart, Microsoft Excel asks if you want the chart updated when you open the chart, even if the worksheet containing the data used in the chart is not open.

For information on	See
Opening a chart template	"Creating and Using a Document Template" in Chapter 16

Online Help also provides information on opening an existing chart. To display online Help, choose the Window Help command. If you are using system software version 7.0 and the Help command does not appear on the Window menu, display Help by pointing to the Help menu icon and choosing the

Microsoft Excel Help command. For information on a specific command, select the Commands topic. For information on using online Help, see "Using Help" in Chapter 1.

Opening a chart

1 Choose File Open.

2 In the list, select the chart you want to open.

If the chart you want to open is not listed, switch to the folder containing the chart by double-clicking the folder name in the list. For more information on changing drives and folders, see "More About Opening an Existing Chart," later in this section.

3 Choose the Open button.

Opening an embedded chart in its own window

If you embedded a chart on a worksheet with the chart tool, you can open the chart in its own window for editing. If you move or size the new window, you'll see the original embedded chart beneath the new chart window. Any changes you make in the new chart window, except for moving and sizing, also affect the embedded chart.

▶ Double-click the embedded chart.

Microsoft Excel opens a window for the embedded chart.

In the chart window, you can also save the embedded chart as a separate document. If you close the chart window without saving, the embedded chart remains on the worksheet and changes you made to the chart will be saved when you save the worksheet. If you delete the embedded chart, the chart window is closed automatically unless you have saved it. For more information on saving a chart as a separate document, see "Saving a Chart" in Chapter 11.

MORE ABOUT

More About Opening an Existing Chart

Guidelines

Changing Disk Drives or Folders When you first choose the File Open command, Microsoft Excel displays the name of the current drive in the upper-right corner of the File Open dialog box and the name of the current folder in a box at the top of the dialog box. The folders and files in the current folder are listed in a box below the name of the current folder. To open a chart in a folder in the current folder, double-click the folder name in the list. The folders and files in the folder you double-clicked are then listed in the box. To open a chart in a higher-level folder above the current folder, point to the current folder name at the top of the dialog box and drag down to select the folder you want. To open a worksheet on another drive, choose the Drive button (or the Desktop button, if you are using system software version 7.0).

MORE ABOUT

Tip

Opening a Chart Template You can open a chart template with the File New command or the File Open command. The File New command lists all templates in your startup folder. To open a template in any other folder, use the File Open command. When you open a template with either the File Open or the File New command, Microsoft Excel does not open the template itself but creates a copy of the template for you to use.

When Microsoft Excel copies a template for you, it opens the new document in the correct file format (worksheet, chart, or macro sheet) and gives it a temporary name. When you create a new chart from a chart template, all formatting and the chart type are retained in the template but the data series that were used to create the chart on the template are not used for the new chart. Instead, Microsoft Excel uses the selection on the active worksheet to supply the data series for the new chart. For more information on creating, editing, and using a chart template, see "Creating and Using a Document Template" in Chapter 16.

Selecting Items in a Chart

You must select a chart item before you can format or edit it. If no chart item is selected, most of the Format menu commands are unavailable and the formula bar is blank.

A chart item, when selected, is marked with white squares or black squares, depending on the type of chart item. These black or white squares tell you that the next command or action will affect the selected item.

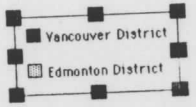


Chart items and text marked with black squares, or *handles*, can be formatted with commands and moved or sized with the mouse.

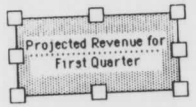


Chart items and text marked with white selection squares cannot be moved or sized directly. Some items, such as the axis labels, can be formatted or realigned with commands.

If chart text is selected, it appears in the formula bar so you can edit it. If series markers are selected, the series formula that Microsoft Excel uses to plot the data series is displayed in the formula bar. You can edit this formula to control how data is plotted.

When a chart is the active document, the reference area in the formula bar tells you what is selected. If the legend is selected, for example, the area displays the word "Legend." If this area displays the code "S1P3," it means the third point of the first series is selected. For more information on what codes are used for the different parts of a chart, see the SELECT function in the *Microsoft Excel Function Reference*.

For information on	See
Selecting in a worksheet or macro sheet	"Selecting Cells and Moving Around the Worksheet" in Chapter 3
Editing a series formula	"Adding, Editing, and Deleting Chart Data" later in this chapter

NOTE If you are working with a chart that was embedded on a worksheet or macro sheet with the chart tool, you must open the chart before performing the procedures in this section. To open an embedded chart, double-click it.

Online Help also provides information on selecting items in a chart. To display online Help, choose the Window Help command. If you are using system software version 7.0 and the Help command does not appear on the Window menu, display Help by pointing to the Help menu icon and choosing the Microsoft Excel Help command. For information on a specific command, select the Commands topic. For information on using online Help, see "Using Help" in Chapter 1.

Selecting Items with the Mouse

You can use the mouse to select items on your chart. The following table lists mouse procedures for selecting items on your chart:

To	Do this
Select an item	Click the chart item you want to select.
Select a data series	Click any marker in the data series.
Select a single data marker	Hold down COMMAND and click the data marker.
Select gridlines	Click a gridline. Make sure the tip of the pointer is pointing exactly to the gridline.
Select an axis	Click the area containing the axis tick mark labels.
Select the entire plot area	Click any area in the plot area not occupied by any other item, including gridlines.
Select the entire chart	Click anywhere outside the plot area where there is not another item.

Selecting Items with the Keyboard

You can move item by item or between classes of items. Microsoft Excel groups chart items into the following classes:

- Chart
- Plot area
- 3-D floor
- 3-D walls
- Legend
- Axes
- Text
- Arrows
- Gridlines
- First data series
- Second data series, and so on
- Drop lines
- Hi-lo lines

When you select chart items with the keyboard, Microsoft Excel moves through the classes of items in the order shown in the previous list.

You use the ARROW keys to select with the keyboard. You can use the UP ARROW and DOWN ARROW keys to move between classes of items and the LEFT ARROW and RIGHT ARROW keys to select items within classes. The following table lists keyboard procedures for selecting items on your chart:

To	Press
Go to the first item in the next class	UP ARROW
Go to the last item in previous class	DOWN ARROW
Go to next item in the same class	RIGHT ARROW
Go to previous item in the same class	LEFT ARROW

Selecting Items with Menu Commands

You can use menu commands to quickly select the entire chart or plot area.

Selecting an entire chart

▶ Choose Chart Select Chart.

Selecting the plot area

▶ Choose Chart Select Plot Area.

Canceling the Selection

When you have an item selected on your chart, you can remove the selection so you can view your chart without the selection squares, or select a different item to edit.

Canceling the selection

▶ Click just inside the chart window where there is no other chart item.

If the chart is selected, click closer to the window edge (outside the chart).

▶ Press ESC.

Adding, Editing, and Deleting Chart Data

Once you have created a chart, you can add more data series or copy additional data series from a worksheet or another chart. On some charts, you can also drag data markers along the value axis to change their value and perform "what-if" analysis.

For information on	See
Specifying data series for Microsoft Excel to plot	"More About Creating a New Chart" in Chapter 11

NOTE If you are adding, editing, or deleting data for a chart that was embedded on a worksheet or macro sheet with the chart tool, you must open the chart before performing the procedures in this section. To open an embedded chart, double-click it. The chart appears in its own chart window so you can make the changes you want.

Online Help also provides information on adding, editing, and deleting chart data. To display online Help, choose the Window Help command. If you are using system software version 7.0 and the Help command does not appear on the Window menu, display Help by pointing to the Help menu icon and choosing the Microsoft Excel Help command. For information on a specific command, select the Commands topic. For information on using online Help, see "Using Help" in Chapter 1.

Adding Data from a Worksheet

You can add data from a worksheet by copying it and pasting it into an existing chart. This procedure is also useful for creating a summary chart that consolidates different data from several worksheets.

There are two ways to add data series from a worksheet to a chart:

- **Let Microsoft Excel control the plotting** Use the Edit Copy and Edit Paste commands to paste the data and let Microsoft Excel control how the data series are organized and plotted. For more information on how Microsoft Excel plots data, see "More About Creating a New Chart" in Chapter 11.

- **Control the plotting yourself** Use the Edit Copy and Edit Paste Special commands to paste the data and control how the data series are organized and plotted. With options in the Edit Paste Special dialog box, you can specify whether you want to make each row or each column in the worksheet selection a data series. You can also specify the source cells for data series names and category names.

NOTE Before starting either of the following procedures, you may want to size the worksheet and chart windows or choose Window Arrange All, so you can see both windows on your screen.

Adding data and letting Microsoft Excel control the plotting

1. Make sure both the worksheet and chart documents are open.
2. Select the worksheet data.
3. Choose Edit Copy.
4. Activate the chart window.
5. Choose Edit Paste.

Adding data and controlling plotting yourself

To do this procedure, you must be using full menus.

1. Make sure both the worksheet and chart documents are open.
2. Select the worksheet data.
3. Choose Edit Copy.
4. Activate the chart window.
5. Choose Edit Paste Special.
6. If the values for the data series are in columns, select the Columns option under Values In.

   If the values for the data series are in rows, select the Rows option under Values In.
7. If the copied worksheet selection includes category names or series names, turn on the appropriate check boxes. If the copied worksheet selection does not include category names or series names, turn off the check boxes for these items.

   If your selection does not include category names and you want to plot the data as xy coordinates on an xy (scatter) chart, turn on the Categories (X Labels) In First Column or Categories (X Labels) In First Row check box, whichever is displayed.
8. Choose OK.

Adding Data Series from Another Chart

You can also add data series to a chart by copying and pasting them from another chart. There are two ways to add data series from another chart:

- **Add all data series and their formats** Use the Edit Paste command to paste all data series and their formats from one chart to another.
- **Selectively add all data series, their formats, or both** Use the Edit Paste Special command to selectively paste the data series, their formats, or both.

NOTE When you add data series from another chart with the Edit Paste command, Microsoft Excel replaces the format of the active chart with that of the copied chart.

Adding all data series and formats from another chart

1. Make sure both chart documents are open.
2. Activate the chart window that contains the data series you want to add.
3. Choose Chart Select Chart.
4. Choose Edit Copy.
5. Activate the chart window containing the chart you want to change.
6. Choose Edit Paste.

Adding only data series or formats from another chart

To do this procedure, you must be using full menus.

1. Make sure both chart documents are open.
2. Activate the chart window that contains the data series or formats you want to add.
3. Choose Chart Select Chart.
4. Choose Edit Copy.
5. Activate the chart window containing the chart you want to change.
6. Choose Edit Paste Special.
7. To paste only the copied formats into the chart, select the Formats option.

   To paste only the copied data series into the chart, select the Formulas option.

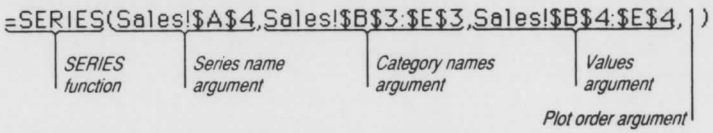
   To paste both the data series and their formats into the chart, select the All option. This is the same as using the Edit Paste command.
8. Choose OK.

Creating a New Data Series or Editing an Existing Series

When you select data on a worksheet and then create a chart, Microsoft Excel evaluates the selection to determine whether rows or columns should make up the data series, and whether the selection contains category names and series names. For each data series, Microsoft Excel then uses this information to create a formula—called a *series formula*—and uses the series formulas to plot the chart.

When you create a chart or paste data from a worksheet or another chart, Microsoft Excel uses the SERIES function to create series formulas for you, but you can also build a series formula yourself. You may want to build a series formula yourself if you want to add a data series to a chart, control plotting, add a data series name, or create a data series that is not linked to a worksheet.

The following illustration shows the parts of a series formula:



For more information about the series formula, its parts, and how it corresponds to the Chart Edit Series dialog box, see "More About Adding, Editing, and Deleting Chart Data," later in this section.

The easiest way to build a series formula yourself, or edit the series formula for an existing data series, is with the Chart Edit Series command. You can also build or edit the series formula directly in the formula bar.

NOTE Before you build or edit a series, you may want to size the worksheet and chart windows or choose Window Arrange All, so you can see both windows on your screen.

Creating or editing series with the Chart Edit Series command

To do this procedure, you must be using full menus.

1. Activate the chart to which you want to add the series, or in which you want to edit the existing series.

   If you want to start with a new blank chart, select a blank cell on the worksheet, choose File New, and select the Chart option.
2. If you want to edit an existing data series, select the series.
3. Choose Chart Edit Series.

4 If you are creating a new data series, select the New Series option in the Series box.

If you are editing an existing data series, the name of the series is selected in the Series box. Microsoft Excel lists unnamed series as "Series *n*" where *n* is the same as the series' plot order number.

5 In the Name box, enter an external absolute reference for the data series name, or type the name.

You can either type the reference, or select the cell that contains the name on the worksheet and Microsoft Excel enters the reference for you.

6 In the X Labels box, type an external absolute reference for the category names of the data series, or select the category names on the worksheet.

If the chart is an xy chart, this option appears as the X Values box. Type an external absolute reference for the x-coordinates, or select the x-coordinates on the worksheet.

7 In the Y Values box, type an external absolute reference for the values of the data series, or select the values on the worksheet.

If the chart is a 2-D scatter chart, you type the reference for the y-coordinates of the series, or select the y-coordinates on the worksheet.

This option is not available for 3-D charts. Instead, the text "Series Name" is displayed.

8 If the chart is a 3-D chart, type an external absolute reference for the data series values in the Z Values box, or select the values on the worksheet.

9 In the Plot Order box, type the order in which you want the series to be plotted.

You can plot up to 255 series.

10 To complete the series formula and close the dialog box, choose OK.

To complete the series formula and keep the dialog box open so you can create or edit another series, choose the Define button.

Building a series formula in the formula bar

You can type a series formula, entering the SERIES function and the appropriate arguments in the formula bar. You can also build the series formula by typing and selecting cells on a worksheet as described in the following procedure.

1 Activate the chart to which you want to add the series.

If you want to start with a new blank chart, select a blank cell on the worksheet, choose File New, and select the Chart option.

2 Type **=series(**

3 If you want to link the data series name to a worksheet cell, select the cell on the worksheet that contains the text you want for the data series name, and then type a comma. This enters in the formula an external absolute reference for the data series name.

If you don't want the data series name linked to a worksheet cell, type a data series name enclosed in quotation marks and followed by a comma. You can also leave out the data series name and type just the comma.

4 Select the area on the worksheet that contains the data you want to use as category names and type a comma. The reference appears in the formula as an external absolute reference.

You can also type the reference, a name, or an array constant followed by a comma. You can specify a multiple selection; to do so, separate the different ranges in the argument with commas, and then enclose the entire argument in parentheses. None of the ranges in a multiple selection can be names. If you save the chart in Microsoft Excel 2.1 format (Microsoft Excel for Windows) or Microsoft Excel 2.2 format (Microsoft Excel for OS/2), only the first range of the multiple selection is saved.

If you don't want a categories reference, type just the comma.

5 Select the area on the worksheet that contains the data you want to use as values and type a comma. The reference appears in the formula as an external absolute reference.

You can also type the reference, a name, or an array constant followed by a comma. You can specify a multiple selection, as described under the previous step.

6 Type the plot order number you want the data series to have, followed by a right parenthesis to finish the formula.

If you type the plot order number of an existing data series, Microsoft Excel renumbers any existing data series with higher plot order numbers. If you leave out the plot order number, Microsoft Excel plots the new data series last, after any existing data series, and supplies the plot order number. You can plot up to 255 data series.

7 Click the enter box or press ENTER.

Microsoft Excel adds the data series to the chart.

For more information on working with formulas, see "Entering a Formula" in Chapter 3.

Editing a series formula in the formula bar

1 Select a marker from the data series to display the series formula you want to edit.

2 Edit the formula, using standard procedures for editing in the formula bar.

3 When you finish editing, click the enter box or press ENTER.

For more information on the series formula, see "More About Adding, Editing, and Deleting Chart Data," later in this section. For more information on working with formulas, see "Entering a Formula" in Chapter 3.

Deleting a Data Series from a Chart

You can delete a series formula with the Edit Clear command, with the Chart Edit Series command, or by deleting the series formula directly in the formula bar.

NOTE Deleting the data series from a chart does not delete the source data from the worksheet.

Deleting a data series with the Edit Clear command

1. Select the series you want to clear from the chart.
2. Choose Edit Clear.
3. Select the Series option.
4. Choose OK.

   Microsoft Excel deletes the data series and redraws the chart.

Deleting a data series with the Chart Edit Series command

To do this procedure, you must be using full menus.

1. Select the data series you want to delete.
2. Choose Chart Edit Series.
3. Choose the Delete button.

   Microsoft Excel deletes the data series and redraws the chart.
4. To delete additional data series, select the series you want to delete in the Series box and choose the Delete button.

   To close the dialog box, choose the Close button.

Deleting a data series in the formula bar

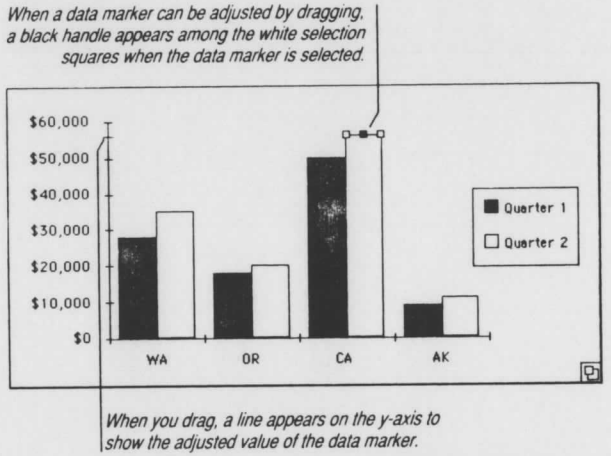
1. Select any marker of the data series you want to delete.

   The formula bar displays the series formula.
2. Press DELETE.
3. Click the enter box or press ENTER.

   Microsoft Excel deletes the data series and redraws the chart.

Adjusting Data Values in a Chart

You can drag the data markers on a chart to increase or decrease their value. When you drag a data marker, the data value on the worksheet changes to match the new value on the chart. By adjusting the data markers, you can quickly view "what-if" scenarios on your chart. You can drag data markers on 2-D line charts, bar charts, and column charts.



You can change a data marker value by holding down COMMAND, clicking the data marker you want to change, and dragging the black handle. You can change the data marker value only within the range defined by the value axis. You cannot drag the white selection squares.

When you are finished dragging the data marker, Microsoft Excel calculates the data marker value based on the current value of the axis and places that value in the worksheet.

If the value of a data marker is generated by a formula, Microsoft Excel activates the worksheet (which must be open) and opens the Formula Goal Seek dialog box so you can adjust the formula variables in order to reach the target value. When the Formula Goal Seek dialog is displayed with the target value, you select the cells that you want to change to achieve the target value. For more information on goal seeking, see "Seeking a Value That Solves a Formula" in Chapter 7.

Adjusting chart values by dragging data markers

The worksheet containing the charted data values must be open before you do the following procedure.

1. Hold down COMMAND and click the data marker on the chart.
2. Drag the black handle in the direction you want to adjust the value.

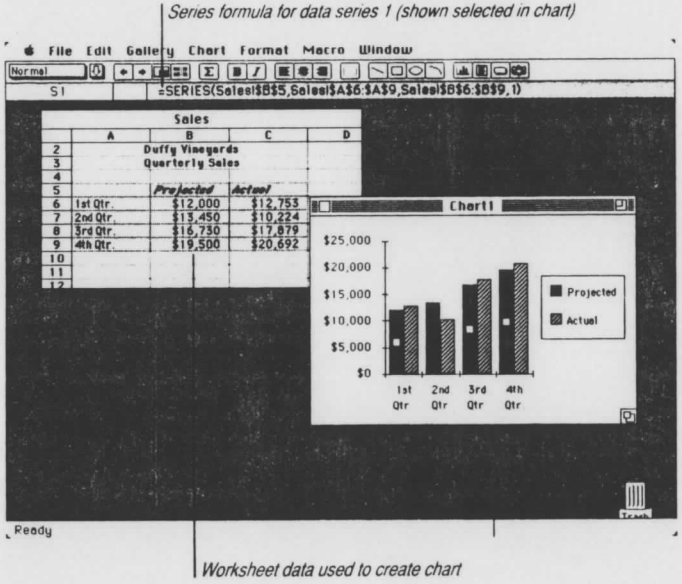
   While you drag, a line appears on the y-axis to show the adjusted value of the data marker. You can drag only within the scale on the value axis.

MORE ABOUT

More About Adding, Editing, and Deleting Chart Data

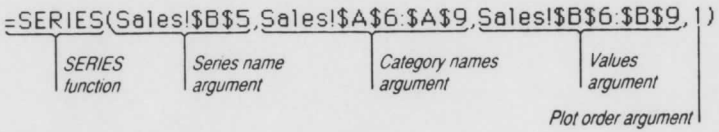
Guideline

Working with Series Formulas A series formula is displayed in the formula bar anytime you select a data series marker in the chart. The following illustration shows a chart and its source data in a worksheet. The series formula for the selected data series is displayed in the formula bar:



MORE ABOUT

Here's a closer look at the series formula shown in the previous illustration:



The first element is a special SERIES function used to build the formula. Its use is limited to charts.

A series formula consists of the SERIES function followed by its four arguments, each of which defines one aspect of the data series. The four arguments correspond to the parts of the Chart Edit Series dialog box. A series formula contains the following parts, in this sequence:

- **SERIES function** Must be preceded by an equal sign and immediately followed by a left parenthesis to mark the beginning of the arguments.
- **Series name argument** (Optional) When you use the series name argument, it must be an external absolute reference to a single cell, or a name defined to be a single cell or a sequence of characters. The argument is immediately followed by a comma. The series name argument can also be text, enclosed in quotation marks (for example: "Mortgage",). The series name argument provides the series name for a chart legend if you add one. This argument corresponds to the Name box in the Chart Edit Series dialog box.
- **Category names argument** (Optional) Must be an external absolute reference to the worksheet name and cells that contain your category names, or x values in an xy (scatter) chart, followed by a comma. You can substitute a named range (unless the argument is for a multiple selection) or an array constant for the cell references. This argument corresponds to the X Labels box in the Chart Edit Series dialog box.

  The category names argument for the series that is plotted first (Plot Order 1) determines the category names arguments for the rest of the series in the chart. If you change the category names in other series it will not affect the chart on the screen. To change the category names of an overlay chart, change the category names argument of the first series of the overlay chart.
- **Values argument** Must be an external absolute reference to the worksheet name and the cells that contain your values, followed by a comma. You can substitute a named range (unless the argument is for a multiple selection) or an array constant for the cell references. The values argument refers to the y values in a 2-D chart and the z values in a 3-D chart. This argument corresponds to the Y Values box for 2-D charts or the Z Values box for 3-D charts in the Chart Edit Series dialog box.

MORE ABOUT

- **Plot order argument** Must be an integer (1, 2, 3, ...), followed by a right parenthesis to mark the end of the formula. This argument defines the order (first, second, third, ...) in which the data series is plotted in the chart. The plot order argument corresponds to the Plot Order box in the Chart Edit Series dialog box.

A series formula uses external absolute references to category names and values on a specific worksheet. An external absolute reference in a chart formula consists of the name of the source worksheet, followed by an exclamation point (!) and the absolute reference of the worksheet referred to. You can substitute external references to named cells and ranges for absolute references. The same rules that apply to external references between linked worksheets apply to external references between a chart and worksheet. For more information, see "Linking Documents" in Chapter 8.

If you change a worksheet value that provides data in a chart, the series formula is recalculated and Microsoft Excel redraws the chart to reflect the change.

If you shift an area of the worksheet in a particular direction by inserting a row or a column, your chart remains unaffected and the series formula updates automatically to the new ranges even if you don't use names to identify the ranges in the series formula.

Deleting a Chart

When you want to delete a chart from a disk, you don't have to quit Microsoft Excel. You can delete a chart file, or any other file on your disk, from within Microsoft Excel with the File Delete command.

NOTE You cannot use the File Delete command to delete a Microsoft Excel document that has been protected with the File Save As command.

You can also keep a chart document but remove the chart data, its formatting, or both by using the Edit Clear command. Then you can just add new data to existing formats, new formats to existing data, or an entirely new chart in the same chart document.

If you embedded a chart on a worksheet with the chart tool, you can remove the chart from the worksheet by selecting the chart and choosing the Edit Clear command or pressing DELETE.

For information on	See
Deleting data in a chart	"Adding, Editing, and Deleting Chart Data" in the previous section

Online Help also provides information on deleting a chart. To display online Help, choose the Window Help command. If you are using system software version 7.0 and the Help command does not appear on the Window menu, display Help by pointing to the Help menu icon and choosing the Microsoft Excel Help command. For information on a specific command, select the Commands topic. For information on using online Help, see "Using Help" in Chapter 1.

Deleting a chart document

IMPORTANT The File Delete command cannot be reversed with the Edit Undo command. If you delete a document from your disk, you can't retrieve it. However, File Delete removes the document from the disk but not from memory. If you inadvertently delete a document that is open, you can save it on your disk again with the File Save As command, because the document is still in memory.

Use the following procedure to delete a chart that has been saved as a separate chart document.

To do this procedure, you must be using full menus.

1. Choose File Delete.
2. In the list, select the chart you want to delete.

   If the chart you want to delete is not listed, switch to the folder containing the chart by double-clicking the folder name in the list. For more information on changing drives and folders, see "More About Deleting a Chart," later in this section.
3. Choose the Delete button.

   Microsoft Excel asks for confirmation before deleting the chart. After you delete a chart, the File Delete dialog box remains on the screen so you can select and delete other charts.
4. To close the dialog box, choose the Close button.

Deleting an embedded chart

Use the following procedure to remove a chart embedded on a worksheet.

1. Open the worksheet containing the embedded chart.
2. Click the embedded chart.
3. Choose Edit Clear or press DELETE.

   Microsoft Excel removes the embedded chart from the worksheet.

Clearing a chart

Use the following procedure when you want to clear the chart, clear the chart formats, or both.

1. Select the entire chart in the chart window.
2. Choose Edit Clear.
3. To clear both the chart data and its formats, select the All option.

   To clear the formats and keep the chart data, select the Formats option.

   To clear the chart data and keep the formats, select the Formulas option.
4. Choose OK.

MORE ABOUT

More About Deleting a Chart

Guidelines

Changing Disk Drives or Folders When you first choose the File Delete command, Microsoft Excel displays the name of the current drive in the upper-right corner of the File Delete dialog box and the name of the current folder in a box at the top of the dialog box. The folders and files in the current folder are listed in a box below the name of the current folder. To delete a chart in a folder in the current folder, double-click the folder name in the list. The folders and files in the folder you double-clicked are then listed in the box. To delete a chart in a higher-level folder above the current folder, point to the current folder name at the top of the dialog box and drag down to select the folder you want. To delete a worksheet on another drive, choose the Drive button (or the Desktop button, if you are using system software version 7.0).

Formatting a Chart

Microsoft Excel gives you almost unlimited control over the appearance of your charts by letting you specify formatting and content details. For example, you can control the color, pattern, and grouping of the data markers, the scale and appearance of axes, and whether or not gridlines or a legend appears in the chart. You can place text or arrows anywhere on your chart to emphasize certain information. And you can create custom data markers to produce charts that carry considerable impact in a presentation or report.

NOTE Unless otherwise noted, all information and procedures for working with worksheets also apply to macro sheets.

Table of Contents

Adding, Deleting, and Formatting a Legend ... 451
Adding, Deleting, and Formatting Axes ... 457
Adding, Deleting, and Formatting Gridlines ... 467
Adding, Deleting, and Formatting a Chart Arrow ... 469
Adding, Deleting, and Formatting Text ... 472
Formatting Chart Data Markers ... 480
Formatting the Plot Area ... 490
Formatting the 3-D Chart View ... 493
Printing a Chart ... 495

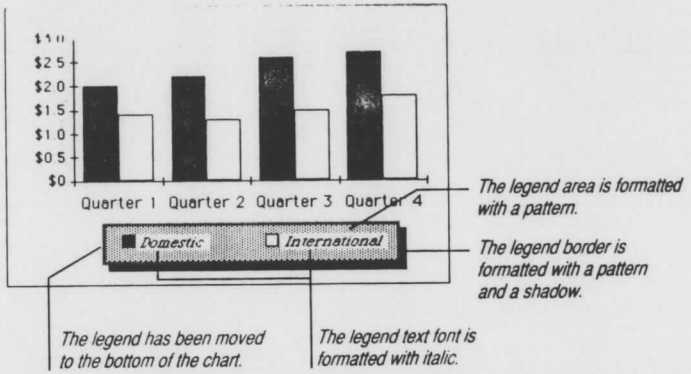
Adding, Deleting, and Formatting a Legend

A *legend* provides a guide to the data series markers in much the same way that a roadmap legend provides a guide to the colors and symbols used on the map. The legend includes each pattern or symbol used as a data marker in the chart, followed by the corresponding data series name. If there is only one data series in the chart, the legend shows the names of the categories within the data series. If the chart is a picture chart (a chart using pasted graphic pictures instead of the normal Microsoft Excel data markers), the legend shows miniature versions of the pictures.

You can display the legend in an automatic position, or you can position and size the legend manually. You can format the legend box area with patterns and colors and format the style, weight, and color of the border around the legend box. You can also change the font of the text within the legend by selecting the legend and choosing Format Font. For more information, see "Adding, Deleting, and Formatting Text," later in this chapter.

The text printed in the legend is taken directly from the worksheet cells containing the data series names or category names. To change the legend text, edit the worksheet cells containing the data series or category names; you can also change the legend text by editing the series formula for each chart data series. For more information, see "Adding, Editing, and Deleting Chart Data" in Chapter 12.

The following illustration shows a legend after it has been moved and formatted:



Online Help also provides information on adding, deleting, and formatting a legend. To display online Help, choose the Window Help command. If you are using system software version 7.0 and the Help command does not appear on the Window menu, display Help by pointing to the Help menu icon and choosing the Microsoft Excel Help command. For information on a specific command, select the Commands topic. For information on using online Help, see "Using Help" in Chapter 1.

NOTE If you are formatting a chart that was embedded on a worksheet or macro sheet with the chart tool, you must open the chart before performing the procedures in this section. To open the chart, double-click it. An open chart appears in its own document window, and you can move it, size it, and close it as you would any document window. You can also activate it from the Window menu. For more information, see "Opening an Existing Chart" in Chapter 12.

Adding and Deleting a Legend

To add a legend, you use the Chart Add Legend command. Once you add a legend, the command changes to Chart Delete Legend. To delete a legend, you use the Chart Delete Legend command.

Adding a legend

To add a legend, the chart window must be active.

▶ Choose Chart Add Legend.

Microsoft Excel inserts a legend at the right of the plot area and resizes the plot area to accommodate the legend.

Deleting a legend

To delete a legend, the chart window containing the legend must be active.

▶ Choose Chart Delete Legend.

Selecting a Legend

When you first add a legend, Microsoft Excel automatically selects it for you so you can immediately format it. However, each time you want to format the legend later, you must first select it. You can select the legend with either the mouse or the keyboard. When selecting in a chart with the keyboard, you use the UP ARROW or DOWN ARROW key to move between classes of objects (such as data series, axes, text, and so on), and use the LEFT ARROW or RIGHT ARROW key to move between items within a class, such as between each of the axes on the chart. For a list of classes, see "More About Adding, Deleting, and Formatting a Legend," later in this section. When you select a legend, Microsoft Excel surrounds it with black selection squares.

Selecting a legend

▶ Click the legend.

▶ Press the UP ARROW or DOWN ARROW key until the legend is selected.

Moving a Legend

You can change the position of the legend by either selecting a new position with the Format Legend command or by dragging the legend to a new position with the mouse. Use the Format Legend command to position the legend in any of five standard positions—bottom, corner (upper-right), top, right, or left. By dragging the legend with the mouse, you can position the legend anywhere in the chart.

If you move the legend using the Format Legend command or drag the legend to the edge of the chart window, Microsoft Excel automatically redraws the chart to make room for the legend in its new position. Microsoft Excel also changes the horizontal or vertical arrangement of the elements in the legend, if needed, to make the legend fit in the chart window better. For example, if you move the legend to the bottom of the chart, Microsoft Excel arranges the legend elements horizontally.

If you drag the legend to some positions, Microsoft Excel cannot move the rest of the chart out of the way, so your legend may overlap other parts of the chart. As you move the legend with the mouse, Microsoft Excel may display a vertical or horizontal bar along an edge of the window. This indicates that the chart will be moved to accommodate the legend.

Positioning the legend with the mouse

▶ Drag the chart legend to the new position.

Positioning the legend with the Format Legend command

1 Select the legend.

2 Choose Format Legend.

3 Select the option for the legend position you want.

4 To open the Format Patterns dialog box so you can format the legend box area and border, choose the Patterns button; then select the options you want.

To open the Format Font dialog box so you can format the font of the legend text, choose the Font button; then select the options you want.

5 To apply all your changes and close the dialog box, choose OK.

Formatting the Legend Box

With the Format Patterns command, you can control the style, color, and weight of the border line around the legend, and the pattern, foreground color, and background color used within the area of the legend box.

Formatting the border and area of the legend box

1 Select the legend and choose Format Patterns, or double-click the legend.

2 Select the border and area options you want.

Under Sample, Microsoft Excel shows you what the new formatting will look like. If you want Microsoft Excel to select the border or area options for you, select the Automatic option under Border or Area.

3 To open the Format Font dialog box so you can format the font of the legend text, choose the Font button; then select the options you want.

To open the Format Legend dialog box so you can reposition the legend, choose the Legend button; then select the options you want.

4 To apply all your changes and close the dialog box, choose OK.

Formatting the legend text

1 Select the legend.

2 Choose Format Font.

3 In the Font box, select the font you want. Under Sample, Microsoft Excel shows you what the new formatting looks like.

To list only the fonts that are installed for your printer, turn on the Printer Fonts check box. To list only the screen display fonts, turn off the Printer Fonts check box.

If the font you want is not listed, type the font name in the box below the Font box.

4 In the Size box, select the font size you want.

If the font size you want is not listed, type the size in the box below the Size box.

5 Under Style, turn on or turn off the styles to set the styles as you want them.

6 In the Color list, select a color.

To set the color to the system font color, select the Automatic option.

7 Under Background, select how you want the area behind the text to appear.

To leave the area behind the text transparent so you can see the pattern behind the text, select the Transparent option.

To remove the pattern from behind the text, but to leave the foreground color behind the text unchanged, select the White Out option.

To have Microsoft Excel select the background option for you, select the Automatic option.

8 To open the Format Patterns dialog box so you can format the border and area of the legend box, choose the Patterns button; then select the options you want.

To open the Format Legend dialog box so you can reposition the legend, choose the Legend button; then select the options you want.

9 To apply all your changes and close the dialog box, choose OK.

NOTE You can also use the bold and italic buttons on the tool bar to format the legend text.

MORE ABOUT

More About Adding, Deleting, and Formatting a Legend

Guideline

Selecting Chart Objects with the Keyboard When selecting chart items with the keyboard, you can move between classes of items or you can move through all the items within a class one at a time. To move between classes of items you use the UP ARROW or DOWN ARROW key. The DOWN ARROW key selects the first item in the next class and the UP ARROW key selects the last item in the previous class. The classes of chart items are:

- Chart
- Plot area
- 3-D floor
- 3-D walls
- Legend
- Axes
- Text
- Arrows
- Gridlines
- First data series
- Second data series, and so on
- Drop lines
- Hi-lo lines

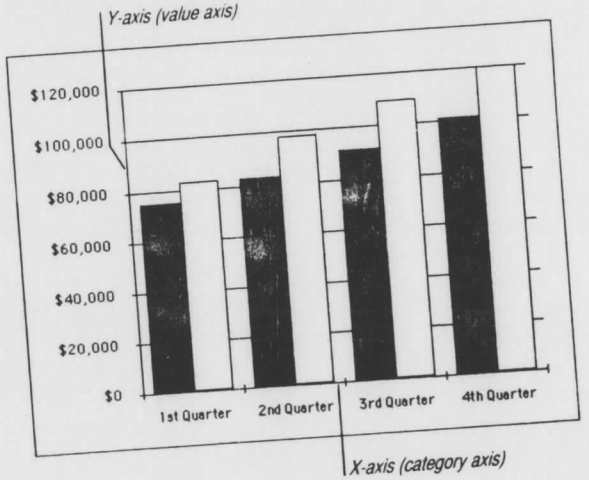
To move item-by-item within a class, use the LEFT ARROW or RIGHT ARROW key. For example, to select the fourth data marker in a data series, press the UP ARROW or DOWN ARROW key until you select the series, and then press the RIGHT ARROW key four times to select the fourth data marker.

Adding, Deleting, and Formatting Axes

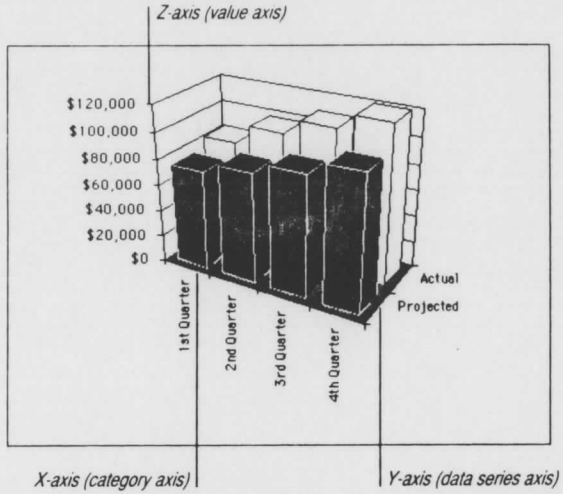
Chart *axes* are the scales against which the chart data is plotted. You can format each of the axes independently to achieve the scale and format you want.

All two-dimensional (2-D) charts except pie charts have two axes—an x-axis and a y-axis. Pie charts have no axes. For 2-D charts, with the exception of bar and pie charts, the data values are plotted along a vertical y-axis and the categories are plotted along a horizontal x-axis. On a bar chart, the x-axis is plotted vertically, and the y-axis is plotted horizontally. For xy (scatter) charts, the x-axis is numerical and is used as a second value axis for plotting xy coordinates. The three-dimensional (3-D) charts that use a 3-D plot have three axes—an x-axis (category axis), y-axis (data series axis), and z-axis (value axis). Note that the value axis for a 3-D chart is still the vertical axis, but it is labeled as the z-axis instead of the y-axis, in accordance with standard mathematical conventions.

The following illustration shows the axes on a 2-D column chart:



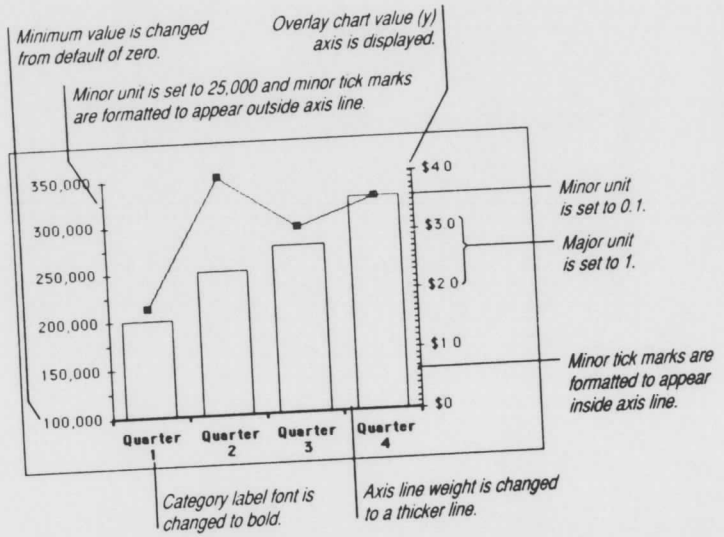
The following illustration shows the axes on a 3-D column chart:



You can control whether chart axes appear on the main chart and on an overlay chart. Overlay chart data can be plotted against a separate x-axis and y-axis or against the same x-axis and y-axis as the main chart. Thus, in a chart with an overlay chart, you can have up to four axes.

With the Format menu commands, you can control the appearance of the axes themselves and the tick mark labels. For example you can determine at what value the axes intersect, how many categories are between x-axis tick mark labels and tick marks, and where the y-axis scale begins and ends. You can also change the color or pattern used for the axis lines and the font used for the tick mark labels.

The following illustration shows some of the ways you can format your chart axes:



Since the number format and content of the tick mark labels are taken from the worksheet, you must edit or format the worksheet cells to change the number format or content of the tick mark labels. You can also attach axis labels to the axes and format these. These are labels for the entire axis, not labels for individual tick marks.

For information on	See
Changing the number format of worksheet cells	"Formatting Worksheet Data" in Chapter 5
Adding and formatting axes labels	"Adding, Deleting, and Formatting Text" later in this chapter

Online Help also provides information on adding, deleting, and formatting axes. To display online Help, choose the Window Help command. If you are using system software version 7.0 and the Help command does not appear on the Window menu, display Help by pointing to the Help menu icon and choosing the Microsoft Excel Help command. For information on a specific command, select the Commands topic. For information on using online Help, see "Using Help" in Chapter 1.

NOTE If you are formatting a chart that was embedded on a worksheet or macro sheet with the chart tool, you must open the chart before performing the procedures in this section. To open the chart, double-click it. An open chart appears in its own document window, and you can move it, size it, and close it as you would any document window. You can also activate it from the Window menu. For more information, see "Opening an Existing Chart" in Chapter 12.

Adding and Deleting Axes

You can control whether or not main chart or overlay chart axes are displayed with the Chart Axes command.

Adding and deleting chart axes

1 Choose Chart Axes.

2 Turn on the check boxes for the axes you want to display. Turn off the check boxes for the axes you don't want to display.

If there is an overlay chart, separate options are included for displaying the overlay chart axes.

3 Choose OK.

Selecting Axes

You can select an axis with either the mouse or the keyboard. When selecting in a chart with the keyboard, you use the UP ARROW or DOWN ARROW key to move between classes of objects (such as data series, axes, text, and so on), and use the LEFT ARROW or RIGHT ARROW key to move between items within a class, such as between each of the axes on the chart. For a list of classes, see "More About Adding, Deleting, and Formatting a Legend," earlier in this chapter. When you select an axis, it is marked with white selection squares at either end of the axis.

Selecting chart axes

▶ Click the axis line or tick mark labels.

Make sure you don't click inside the axis line or you may select the plot area, gridlines, or a data marker.

1 Press the UP ARROW or DOWN ARROW key until one of the axes is selected.

2 If the correct axis is not selected, press the LEFT ARROW or RIGHT ARROW key until the axis you want is selected.

You can also check to see which axis is selected by looking at the reference area just to the left of the formula bar. The following two tables show what the reference area displays when a particular axis is selected.

For 2-D charts:

If the reference area displays	The selected axis is the
Axis 1	Y-axis (value axis)
Axis 2	X-axis (category axis)
Axis 3	Overlay y-axis (value axis)
Axis 4	Overlay x-axis (category axis)

For 3-D charts:

If the reference area displays	The selected axis is the
Axis 1	Z-axis (value axis)
Axis 2	X-axis (category axis)
Axis 3	Y-axis (data series axis)

Formatting the Axis Scale

You can control the scale settings used for each of the chart axes with the Format Scale command. Different options are available depending on which axis you are formatting. The following lists describe the scale options that are available for each of the axes—the category axis, value axis, and data series axis.

The following list describes the options available when you select the category axis (x-axis) and choose Format Scale. On most charts, the category axis is the horizontal axis. On bar charts, the category axis is vertical. On an xy (scatter) chart, the x-axis is not used as a category axis but is used as a second value axis, so Microsoft Excel displays the options for a value axis when you choose the Format Scale command with the x-axis selected.

- **Value (Y) Axis Crosses At Category Number** Specifies the number of the category at which you want the value axis to cross the category axis. This option is not available for 3-D charts.
- **Number Of Categories Between Tick Labels** Specifies which categories you want labeled. For example, an entry of 1 displays the label for every category, an entry of 2 displays a label for every other category, an entry of 3 displays a label for every third category, and so on.
- **Number Of Categories Between Tick Marks** Specifies the number of categories you want to appear between tick marks. For example, an entry of 2 would display a tick mark for the first and third categories, but not the second category.

- **Value (Y) Axis Crosses Between Categories** For a 2-D chart, controls whether the value axis is displayed at the edge of the category indicated in the Value (Y) Axis Crosses At Category Number box or in the middle of the category. For 2-D charts and 3-D line and area charts, this option controls whether data is plotted at the tick marks or between tick marks. When this option is turned on, data markers are plotted between the tick marks and gridlines, and the tick marks and gridlines appear at the edges of the categories. When this option is turned off, data markers are plotted at the tick mark positions and the category axis gridlines cross through the center of a category. This option changes to Value (Z) Axis Crosses Between Categories when the active chart is a 3-D chart.
- **Categories In Reverse Order** Reverses the displayed order of the categories and the data within a category. This does not reverse the plot order of the data or the categories but just displays them in reverse order.
- **Value (Y) Axis Crosses At Maximum Category** (2-D charts only) Displays the value axis at the last plotted category. This option overrides the Value (Y) Axis Crosses At Category Number option.

The following list describes the options available when you select the value axis and choose Format Scale. On most charts, the value axis is the y-axis and is the vertical axis. On bar charts, the value axis is horizontal. On all 3-D charts, the value axis is the vertical z-axis. On xy (scatter) charts, the x-axis is also a value axis so Microsoft Excel displays the value axis options described in the following list when you choose the Format Scale command with the x-axis selected. The first five options shown in the following list can be set to automatic by turning on the Auto check box next to the option. The result of turning on the Auto check box for an option is described in the list.

- **Minimum** Specifies the smallest data value you want displayed on the chart. Values below the number you specify are not shown on the chart, although the source data on the worksheet is not affected. If you turn on the Auto check box for this option, Microsoft Excel displays all values.
- **Maximum** Specifies the highest data value you want displayed on the chart. Values above the number you specify are not shown on the chart, although the source data on the worksheet is not affected. If you turn on the Auto check box for this option, Microsoft Excel displays all values.
- **Major Unit** Specifies the increment between major tick marks. If you turn on the Auto check box for this option, Microsoft Excel calculates the increment based on the range of values plotted in the chart and the current size of the chart and, if you size the chart, Microsoft Excel automatically adjusts the scale.

- **Minor Unit** Specifies the increment between minor tick marks. If you turn on the Auto check box for this option, Microsoft Excel calculates the increment based on the major unit increment and the current size of the chart and, if you size the chart, Microsoft Excel automatically adjusts the scale.
- **Category (X) Axis Crosses At** Specifies the value at which you want the category axis to cross the value axis. If you turn on the Auto check box for this option, the category axis crosses at zero or, if the value axis scale does not include zero, the value closest to zero. If you select the x-axis of an xy (scatter) chart, this option is replaced with Value (Y) Axis Crosses At and specifies the value at which you want the y-axis to cross the x-axis. For 3-D charts, this option is replaced with the Floor (XY Plane) Crosses At option.
- **Floor (XY Plane) Crosses At** Specifies the value at which you want the floor of a 3-D plotted chart to cross the value axis (z-axis). If you turn on the Auto check box for this option, the floor crosses at zero or, if the value axis scale does not include zero, the value closest to zero.
- **Logarithmic Scale** Recalculates the Minimum, Maximum, Major Unit, and Minor Unit values as powers of 10, based on the range of data plotted in the chart. If all data values are zero or less, the minimum is set to 0.1 and the maximum is set to 1. If you change the major unit, it must be a power of 10. If you change the minor unit, it must be one-half or one-tenth of the major unit.
- **Values In Reverse Order** Inverts the chart and displays the lowest value on the scale at the top of the chart and the highest value on the scale at the bottom of the chart. If you select the x-axis of an xy (scatter) chart, this option is replaced with Categories In Reverse Order and reverses the x-axis scale.
- **Category (X) Axis Crosses At Maximum Value** Displays the category axis at the highest value. This option overrides the Category (X) Axis Crosses At option. If you select the x-axis of an xy (scatter) chart, this option is replaced with Value (Y) Axis Crosses At Maximum Category and displays the y-axis at the highest x-axis value. For 3-D charts, this option is replaced with the Floor (XY Plane) Crosses At Minimum Value option.
- **Floor (XY Plane) Crosses at Minimum Value** Displays the floor of the 3-D plotted chart at the lowest value on the chart. This check box overrides the Floor (XY Plane) Crosses At option.

The following list describes the options available when you select the data series axis on a 3-D chart and choose Format Scale. The data series axis appears only on 3-D charts that are plotted with three axes. In a 3-D chart, the data series axis is the y-axis and the value axis is the z-axis.

- **Number Of Series Between Tick Labels** Specifies which series you want labeled. For example, an entry of 1 displays a label for every series, an entry of 2 displays a label for every other series, an entry of 3 displays a label for every third series, and so on.
- **Number Of Series Between Tick Marks** Specifies the number of series you want to appear between tick marks. For example, an entry of 2 displays a tick mark for the first and third series, but not the second series.
- **Series in Reverse Order** Reverses the displayed order of the series. This does not reverse the plot order of the series but just displays them in reverse order.

Formatting the axis scale

1 Select the axis you want to format.

2 Choose Format Scale.

3 Enter values or turn on or turn off check boxes to achieve the scale format you want.

4 To open the Format Patterns dialog box so you can format the axis line, the tick marks, or location of the tick mark labels, choose the Patterns button; then select the options you want.

To open the Format Font dialog box so you can format the font of the tick mark labels, choose the Font button; then select the options you want.

To open the Format Text dialog box so you can format the orientation of the tick mark labels, choose the Text button; then select the options you want.

5 To apply all your changes and close the dialog box, choose OK.

Formatting the Axis, Tick Mark Labels, and Tick Mark Appearance

You can control the appearance of the axis lines, tick marks, and position of the tick labels with the Format Patterns command.

You can also change the font used for the tick mark labels with the Format Font command. The number format and the content of the tick mark labels is taken from the worksheet, so you must edit the worksheet cells to change the tick mark label contents or the number format of numbers used as tick mark labels.

Formatting axes patterns and tick mark and label location

1 Select the axis you want to format and choose Format Patterns, or double-click the axis or its tick mark labels.

2 Under Axis, select the style, color, and weight you want used for the axis line.

Under Sample, Microsoft Excel shows you what the new formatting will look like. If you want Microsoft Excel to select the axis style, color, and weight options for you, select the Automatic option.

3 Under Tick Mark Type, select the alignment (relative to the axis line) you want for major tick marks and minor tick marks.

4 Under Tick Labels, select the position on the chart where you want the tick labels to appear.

To display no tick labels, select the None option.

To display tick labels at the low end of the perpendicular axis, select the Low option.

To display tick labels at the high end of the perpendicular axis, select the High option.

To always display tick labels next to the axis line, no matter where you move the axis on the chart, select the Next To Axis option.

5 To open the Format Font dialog box so you can format the font of the tick mark labels, choose the Font button; then select the options you want.

To open the Format Text dialog box so you can format the orientation of the tick mark labels, choose the Text button; then select the options you want.

To open the Format Scale dialog box so you can format the axis scale, choose the Scale button; then select the options you want.

6 To apply all your changes and close the dialog box, choose OK.

Formatting the tick mark label font

1 Select the axis whose tick mark labels you want to format.

2 Choose Format Font.

3 In the Font box, select the font you want. Under Sample, Microsoft Excel shows you what the new formatting will look like.

To list only the fonts that are installed for your printer, turn on the Printer Fonts check box. To list only the screen display fonts, turn off the Printer Fonts check box.

If the font you want is not listed, type the font name in the box below the Font box.

4 In the Size box, select the font size you want.

If the size is not listed, type the size in the box below the Size box.

5 Under Style, turn on or turn off the styles to set the styles as you want them.

6 In the Color list, select a color.

To set the color to the system font color, select the Automatic option.

7 Under Background, select how you want the area behind the text to appear.

To leave the area behind the text transparent so you can see the pattern behind the text, select the Transparent option.

To remove the pattern from behind the text but to leave the foreground color behind the text unchanged, select the White Out option.

To have Microsoft Excel select the background option for you, select the Automatic option.

8 To open the Format Patterns dialog box so you can format the axis line, the tick marks, or location of the tick mark labels, choose the Patterns button; then select the options you want.

To open the Format Text dialog box so you can format the orientation of the tick mark labels, choose the Text button; then select the options you want.

To open the Format Scale dialog box so you can format the axis scale, choose the Scale button; then select the options you want.

9 To apply all your changes and close the dialog box, choose OK.

NOTE You can also use the bold and italic buttons on the tool bar to format the text for the selected axis.

Formatting the tick mark label orientation

1 Select the axis whose tick mark labels you want to format.

2 Choose Format Text.

3 Under Orientation, select the text orientation you want.

4 To open the Format Patterns dialog box so you can format the axis line, the tick marks, or location of the tick mark labels, choose the Patterns button; then select the options you want.

To open the Format Font dialog box so you can format the font of the tick mark labels, choose the Font button; then select the options you want.

To open the Format Scale dialog box so you can format the axis scale, choose the Scale button; then select the options you want.

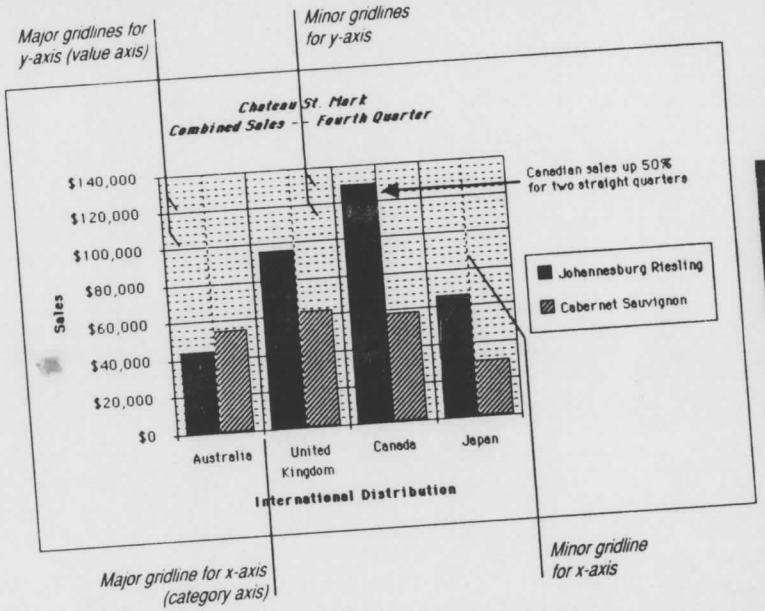
5 To apply all your changes and close the dialog box, choose OK.

Adding, Deleting, and Formatting Gridlines

Gridlines are lines that extend from the axis across the plot area to help guide the eye from the data marker to the corresponding value or category on the axis. Adding gridlines can make a chart much more readable, especially if the chart is very large.

You can add gridlines for any axis in a chart. In 3-D charts, the z-axis gridlines are displayed along the back and side walls of the plot area and the x-axis and y-axis gridlines are displayed across the base, or floor, of the chart. For any chart, you can add gridlines that correspond to either major or minor tick marks on the axes and you can format the line color, style, and weight of the major and minor gridlines separately.

The following illustration shows the major and minor gridlines for the x-axis and y-axis in a column chart.



Online Help also provides information on adding, deleting, and formatting gridlines. To display online Help, choose the Window Help command. If you are using system software version 7.0 and the Help command does not appear on the Window menu, display Help by pointing to the Help menu icon and choosing the Microsoft Excel Help command. For information on a specific command, select the Commands topic. For information on using online Help, see "Using Help" in Chapter 1.

NOTE If you are formatting a chart that was embedded on a worksheet or macro sheet with the chart tool, you must open the chart before performing the procedures in this section. To open the chart, double-click it. An open chart appears in its own document window, and you can move it, size it, and close it as you would any document window. You can also activate it from the Window menu. For more information, see "Opening an Existing Chart" in Chapter 12.

Adding and deleting gridlines

You add or delete gridlines with the Chart Gridlines command. The options in the Chart Gridlines dialog box vary depending on whether the active chart is a 2-D chart or a 3-D chart.

1. Choose Chart Gridlines.
2. Turn on the check boxes for the gridlines you want displayed. Turn off the check boxes for gridlines you don't want displayed.
3. Choose OK.

Selecting gridlines

You can select gridlines with either the mouse or the keyboard. When selecting in a chart with the keyboard, you use the UP ARROW or DOWN ARROW key to move between classes of items (such as data series, axes, text, and so on), and use the LEFT ARROW or RIGHT ARROW key to move between items within a class, such as between major and minor gridlines. For a list of classes, see "More About Adding, Deleting, and Formatting a Legend," earlier in this chapter. When you select a gridline, it is marked with white selection squares at either end of the gridline. You need to select only one major or minor gridline for an axis to select all the major or minor gridlines for that axis.

- Click the gridline.

1. Press the UP ARROW or DOWN ARROW key until one of the gridlines is selected.
2. If the correct type of gridline is not selected, press the LEFT ARROW or RIGHT ARROW key until the type of gridline you want is selected.

Formatting gridlines

With the Format Patterns command, you control the line color, style, and weight used for each type of gridline you add. For example, you can format the y-axis minor gridlines as dashed lines and the x-axis major gridlines as solid thin lines as shown in the previous illustration.

1. To format all major gridlines for an axis, select one of the major gridlines for the axis and choose Format Patterns, or double-click the gridline.

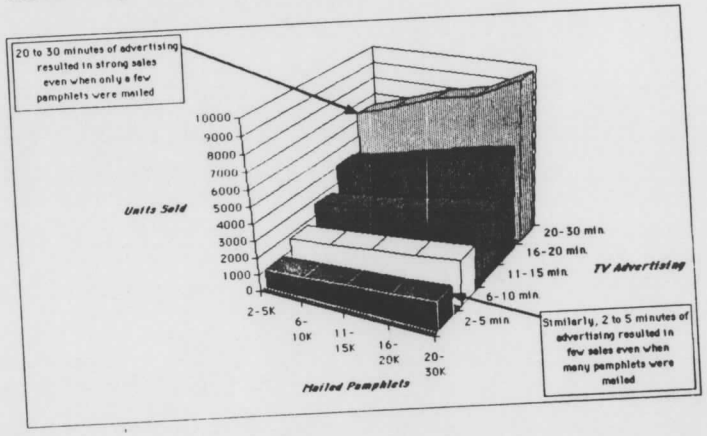
   To format all minor gridlines for an axis, select one of the minor gridlines for the axis and choose Format Patterns, or double click the gridline.
2. Select the style, color, and weight options you want to use for the gridlines.

   Under Sample, Microsoft Excel shows you what the new formatting will look like. If you want Microsoft Excel to select the style, color, and weight options for you, select the Automatic option.
3. Choose OK.

Adding, Deleting, and Formatting a Chart Arrow

You can add arrows to your chart to call out important information, to connect unattached text to a specific data series or data marker, or to point out an item on the chart that might otherwise go unnoticed.

The following illustration shows arrows pointing from unattached text:



NOTE If you are formatting a chart that was embedded on a worksheet or macro sheet with the chart tool, you must open the chart before performing the procedures in this section. To open the chart, double-click it. An open chart appears in its own document window, and you can move it, size it, and close it as you would any document window. You can also activate it from the Window menu. For more information, see "Opening an Existing Chart" in Chapter 12.

Adding a Chart Arrow

To add a chart arrow, you use the Chart Add Arrow command.

Adding a chart arrow

To add a chart arrow, the chart window must be active, and no existing arrow should be selected.

▶ Choose Chart Add Arrow.

Microsoft Excel inserts an arrow in the chart. You can move or size the arrow as you want.

Selecting a Chart Arrow

When you first add an arrow, Microsoft Excel automatically selects it for you so you can immediately format it. However, each time you want to format the arrow later, you must first select it. You can select the arrow with either the mouse for the keyboard. When selecting in a chart with the keyboard, you use the UP ARROW or DOWN ARROW key to move between classes of items (such as data series, axes, text, and so on), and use the LEFT ARROW or RIGHT ARROW key to move between items within a class, such as between different arrows. For a list of classes, see "More About Adding, Deleting, and Formatting a Legend," earlier in this chapter.

Selecting a chart arrow

▶ Click the arrow.

1. Press the UP ARROW or DOWN ARROW key until an arrow is selected.
2. If the correct arrow is not selected, press the LEFT ARROW or RIGHT ARROW key until the arrow you want is selected.

Deleting a Chart Arrow

To delete an arrow, you must first select it. When an arrow is selected, the Chart Add Arrow command changes to the Chart Delete Arrow command.

Deleting a chart arrow

1. Select the arrow you want to delete.
2. Choose Chart Delete Arrow.

Moving or Sizing a Chart Arrow

You can change the position and size of the arrow by dragging the arrow to a new position or length with the mouse or by choosing the Format Move or Format Size commands.

Moving a chart arrow

▶ Drag the arrow shaft to the position you want.

1. Select the arrow you want to move.
2. Choose Format Move.
3. Press the ARROW keys until the arrow is where you want it.

   To move the arrow in smaller increments, hold down CTRL and press an ARROW key.
4. Press ENTER.

Sizing a chart arrow and changing its direction

1. Select the arrow whose size or direction you want to change.
2. Drag the handles until the arrow is the size you want and pointing in the direction you want.

1. Select the arrow whose size or direction you want to change.
2. Choose Format Size.
3. Press the ARROW keys until the arrow is the size you want and pointing in the direction you want.

   To size the arrow in smaller increments, hold down CTRL and press an ARROW key.
4. Press ENTER.

Formatting a Chart Arrow

You can control the style, color, and line weight of the arrow shaft as well as the style, width, and length of the arrowhead by using the Format Patterns command.

Formatting the arrow shaft and arrowhead

1. Select the arrow and choose the Format Patterns command, or double-click the arrow.
2. Under Line, select the style, color, and weight options you want for the arrow shaft.

   Under Sample, Microsoft Excel shows you what the new formatting will look like. If you want Microsoft Excel to select these options for you, select the Automatic option.

3 Under Arrow Head, select the style, width, and length options for the arrowhead.

4 To apply your changes and close the dialog box, choose OK.

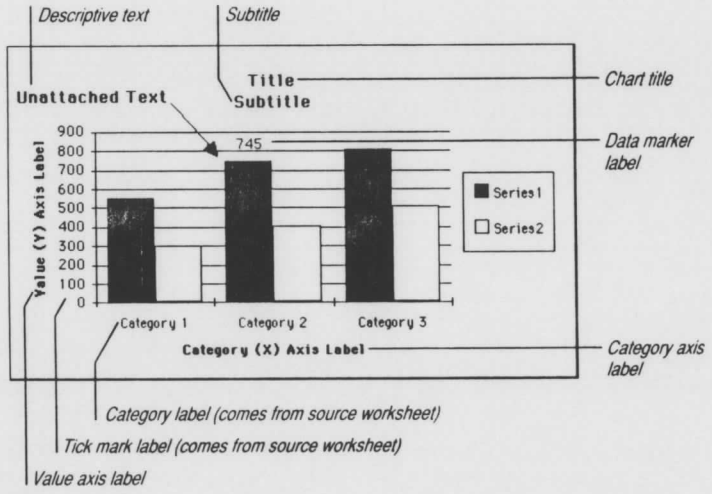
Adding, Deleting, and Formatting Text

When you create a chart, Microsoft Excel automatically adds some text to the chart, such as tick mark labels along the axes. However, you can add other descriptive text to a chart to make the chart easier to understand or to emphasize certain information.

You can add two types of text to a chart—*attached text* and *unattached text*. Attached text is attached to a chart object, such as a data marker. Attached text moves with the chart object and cannot be moved separately. Unattached text can be placed anywhere on the chart. Adding unattached text is useful for creating subtitles or comments, or for use with chart arrows to emphasize elements in the chart.

Instead of typing the text in the chart, you can also link either attached or unattached text to a worksheet cell. The text is then taken from the worksheet cell and always reflects any changes made to the worksheet cell. The tick mark labels and legend text are examples of linked text.

The following illustration shows examples of attached and unattached text. The descriptive text and subtitle are unattached text. The remaining text is attached text.



For information on	See
Editing legend text	"Adding, Deleting, and Formatting a Legend" earlier in this chapter
Adding arrows to create pointers from text to chart elements	Adding, Deleting, and Formatting a Chart Arrow" preceding in this chapter

Online Help also provides information on adding, deleting, and formatting text. To display online Help, choose the Window Help command. If you are using system software version 7.0 and the Help command does not appear on the Window menu, display Help by pointing to the Help menu icon and choosing the Microsoft Excel Help command. For information on a specific command, select the Commands topic. For information on using online Help, see "Using Help" in Chapter 1.

NOTE If you are formatting a chart that was embedded on a worksheet or macro sheet with the chart tool, you must open the chart before performing the procedures in this section. To open the chart, double-click it. An open chart appears in its own document window, and you can move it, size it, and close it as you would any document window. You can also activate it from the Window menu. For more information, see "Opening an Existing Chart" in Chapter 12.

Adding Chart Text

You add attached text with the Chart Attach Text command. You can attach a chart title, an axis label for any axis, or a data marker label showing the value of a particular data marker. You add unattached text just by typing when no other text is selected.

You can distinguish between attached and unattached text by selecting the text. When you select attached text, Microsoft Excel surrounds the text with white selection squares. The white squares indicate that the text cannot be moved or sized. When you select unattached text, Microsoft Excel surrounds the text with black selection handles that you can drag to move and resize the text.

Adding attached text

1 If you want to attach text to a data marker, select the data marker by holding down COMMAND and clicking the marker. With the keyboard, use the UP ARROW or DOWN ARROW key to select the data series containing the data marker, and then the LEFT ARROW or RIGHT ARROW key to select the marker.

2 Choose Chart Attach Text.

3 Select the option that corresponds to the part of the chart to which you want to add text. If you select the Series And Data Point option, type the data series plot number and data point plot number in the Series Number and Point Number boxes.

If you selected a data marker in step 1, Microsoft Excel automatically displays the numbers for the currently selected data marker in these boxes. For an area chart, you can enter only the data series number to label the entire series.

4 Choose OK.

Microsoft Excel adds default text in the appropriate chart location and surrounds the text with white selection squares.

5 Type the text you want to appear. The text appears in the formula bar. You can edit the text in the formula bar, just as you would edit text for a worksheet cell.

To insert a line break in the text, press COMMAND+OPTION+ENTER.

6 Click the enter box or press ENTER.

Adding unattached text

To add unattached text, you just type the text while no other text is selected.

1 Make sure no other text in the chart is selected.

2 Type the text you want.

The text appears in the formula bar. You can edit the text in the formula bar, just as you would edit text for a worksheet cell.

To insert a line break in the text, press COMMAND+OPTION+ENTER.

3 Click the enter box or press ENTER.

Microsoft Excel places the text on the chart and surrounds the text with black selection handles indicating that you can move and size the text.

Selecting Chart Text

When you first create chart text, Microsoft Excel automatically selects that text for you so you can immediately edit or format it. However, each time you want to edit or format the text later, you must first select it. You can select text with either the mouse or the keyboard. When selecting in a chart with the keyboard, you use the UP ARROW or DOWN ARROW key to move between classes of objects (such as data series, axes, text, and so on), and use the LEFT ARROW or RIGHT ARROW key to move between items within a class, such as between different pieces of text. For a list of classes, see "More About Adding, Deleting, and Formatting a Legend," earlier in this chapter. When you select attached text, Microsoft Excel surrounds it with white selection squares. When you select unattached text, Microsoft Excel surrounds it with black selection squares.

Selecting chart text

▶ Click the text.

1 Press the UP ARROW or DOWN ARROW key until a piece of text is selected.

2 If the correct text is not selected, press the LEFT ARROW or RIGHT ARROW key until the text you want is selected.

Deleting Chart Text

Before deleting attached or unattached text, you must first select the text you want to delete.

Deleting chart text

1 Select the text.

2 Press DELETE.

3 Click the enter box or press ENTER.

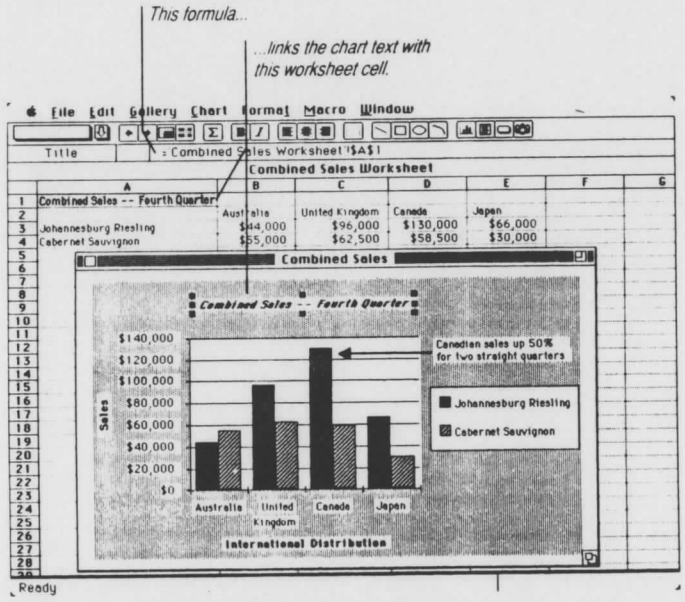
Linking Chart Text to a Worksheet Cell

You can link any attached or unattached chart text to a worksheet cell to display the text or value displayed in the worksheet cell. You may want to use linked text if you always want the chart text to reflect changes made to the worksheet. To edit linked text, you must edit the worksheet cell linked to the chart text. To format linked text, you must format the text on the chart.

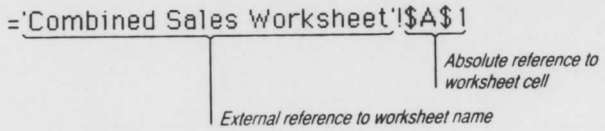
You create linked text by typing a formula that includes a reference to the source worksheet instead of typing the text on the chart. Follow these rules when creating the reference formula:

- The source worksheet must be open when you create the formula.
- The reference to the source worksheet may be a name defined on the worksheet or a reference to a single cell. If the reference is a name, the name must refer to only one cell.
- If the name of the source worksheet contains spaces, does not start with a letter, or contains symbols that Microsoft Excel uses as operators or attaches other meaning to in formulas, such as $, you must enclose the worksheet name in single quotation marks. For information on valid names, see "Naming Cells and Formulas" in Chapter 6.
- The reference formula must start with an equal sign, followed by the name of the source worksheet and an exclamation point (!). You type the cell reference or name following the exclamation point.
- Make sure the chart text is formatted the way you want. Changing the format of the text on the worksheet does not change the formatting of the chart text.

The following illustration shows an example of linked chart text:



The syntax of the formula shown in the illustration is as follows:



Linking text to a worksheet cell

1. Select the text on the chart.
2. Type an equal sign.

   Microsoft Excel clears any existing text from the formula bar.
3. Activate the worksheet window and select the cell that contains the data or text you want shown in your chart.

   You can also type the reference to the worksheet cell.
4. Click the enter box or press ENTER.

Editing Attached and Unattached Chart Text

You edit attached and unattached chart text in the formula bar using the same techniques that you use for editing worksheet cells. For information on editing in the formula bar, see "Editing Worksheet Data" in Chapter 3.

Editing chart text

1. Select the text.

   If the text is linked to a worksheet, activate the worksheet and select the linked cell.
2. Activate the formula bar by clicking the formula bar or pressing COMMAND+U.

   If you don't activate the formula bar, all the existing text is automatically replaced with the new text you type.
3. Edit the text in the formula bar using the same techniques you use for editing worksheet cells.
4. Click the enter box or press ENTER.

Formatting Chart Text

You can change the chart text font, alignment, and orientation. You can also change the pattern and color of the text area and the color, weight, and style for the border around the text. Microsoft Excel automatically formats the chart title and axis labels as bold.

Formatting the chart text font

You can change the font for a selected piece of text or you can change the font for all text in a chart.

1. To format all text in the chart, select the chart by choosing the Chart Select Chart command.

   To format a single piece of attached or unattached text, select the text.

   To format tick mark labels for an axis, select the axis.
2. Choose Format Font.
3. In the Font box, select the font you want. Under Sample, Microsoft Excel shows you what the new formatting looks like.

   If the font you want is not listed, type the font name in the box below the Font box.

4 In the Size box, select the font size you want.

If the font size you want is not listed, type the size in the box below the Size box.

5 Under Style, turn on or turn off the styles to set the styles as you want them.

6 In the Color list, select a color.

To set the color to the system font color, select the Automatic option.

7 Under Background, select how you want the area behind the text to appear.

To leave the area behind the text transparent so you can see the pattern behind the text, select the Transparent option.

To remove an existing pattern from behind the text, but to leave the foreground color behind the text unchanged, select the White Out option.

To have Microsoft Excel select the background option for you, select the Automatic option.

8 To open the Format Text dialog box so you can format the alignment and orientation of the text, choose the Text button; then select the options you want. The Text button is not available if you selected the entire chart in step 1.

To open the Format Patterns dialog box so you can format the text border and area, choose the Patterns button; then select the options you want.

9 To apply all of your changes and close the dialog box, choose OK.

NOTE You can also use the bold, italic, and—for attached and unattached text—alignment tools on the tool bar to format the selected chart text.

Formatting chart text alignment and orientation

You can change the horizontal and vertical alignment of attached and unattached chart text and you can also rotate text to a vertical orientation. The alignment options align the text to the edges of the area containing the text. You can also choose whether the border automatically changes size to fit the text or stays the same size until you change it. If you attach text to a data marker, you can also display the marker or series pattern next to the text, or replace the text with the data marker's value.

1 Select the text.

2 Choose Format Text.

3 Under Horizontal, select the horizontal alignment you want.

4 Under Vertical, select the vertical alignment you want.

5 To rotate the text to a different orientation, select the orientation you want under Orientation.

6 For unattached text, turn on the Automatic Size check box if you want the text border to adjust automatically to fit the text. Once you size the text border yourself, Automatic Size is turned off. If you want the text border size to remain fixed until you change it, turn off the Automatic Size check box.

7 To restore attached text to the default text entered by Microsoft Excel when you first added the text, turn on the Automatic Text box.

8 If the selected text is attached to a data marker, turn on the Show Value check box to replace the text with the data marker's value. Or turn on the Show Key check box to display the pattern used by the data marker or series next to the data marker text.

9 To open the Format Patterns dialog box so you can format the text box border and fill, choose the Patterns button; then select the options you want.

To open the Format Font dialog box so you can format the font of the text, choose the Font button; then select the options you want.

10 To apply all your changes and close the dialog box, choose OK.

Formatting text borders and area patterns

You can format the style, color and weight of the text border, as well as add a shadow to the right and below the border. You can also select a variety of patterns and colors to use for the text area. The text is always placed in front of the area pattern so it is always visible.

1 Select the text and choose the Format Patterns command, or double-click the text.

2 Select the border and area options you want.

Under Sample, Microsoft Excel shows you what the new formatting looks like. If you want Microsoft Excel to select the border or area options for you, select the Automatic option under Border or Area.

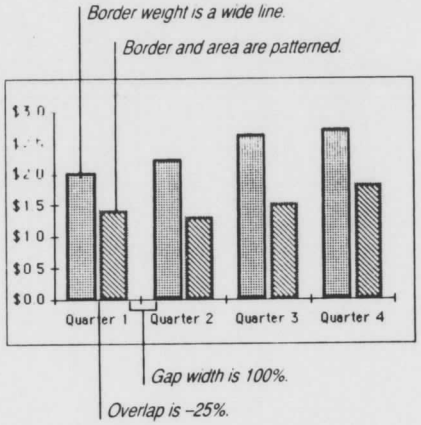
3 To open the Format Font dialog box so you can format the font of the text, choose the Font button; then select the options you want.

To open the Format Text dialog box so you can format the alignment and orientation of the text, choose the Text button; then select the options you want.

4 To apply all of your changes and close the dialog box, choose OK.

Formatting Chart Data Markers

You can control the format of the data series markers, including their patterns, color, and spacing. The following illustration shows a column chart with custom formatted data markers:



You can even import a picture to use as the data series markers for column, bar, and line charts to create a *picture chart*.

You format the main chart data series markers separately from overlay chart data series markers; however, the same formatting options are available for both charts.

NOTE Before custom formatting data series markers, you should use the Gallery menu commands to select the chart format that most closely resembles the chart you want to create. If you apply custom formats with the Format menu commands, some of these formats will be overridden if you then choose a different Gallery command option.

For information on	See
Adding an overlay chart	"Creating an Overlay Chart" in Chapter 11

Online Help also provides information on formatting chart data markers. To display online Help, choose the Window Help command. If you are using system software version 7.0 and the Help command does not appear on the Window menu, display Help by pointing to the Help menu icon and choosing the Microsoft Excel Help command. For information on a specific command, select the Commands topic. For information on using online Help, see "Using Help" in Chapter 1.

NOTE If you are formatting a chart that was embedded on a worksheet or macro sheet with the chart tool, you must open the chart before performing the procedures in this section. To open the chart, double-click it. An open chart appears in its own document window, and you can move it, size it, and close it as you would any document window. You can also activate it from the Window menu. For more information, see "Opening an Existing Chart" in Chapter 12.

Selecting Data Markers

To format chart data series markers, you must select them first.

Selecting data markers

▶ To select all of the markers in a series, click any marker in the series.

To select a single marker, hold down COMMAND and click the marker.

▶ To select all of the markers in a series, press the UP ARROW or DOWN ARROW key to move through the chart items until the data series is selected.

To select a single marker, press the UP ARROW or DOWN ARROW key to select the series containing the marker, and then press the LEFT ARROW or RIGHT ARROW key to select the marker you want.

Formatting Marker Arrangement and Spacing

Using the Format Main Chart and Format Overlay commands, you can arrange the main chart or the overlay chart data markers in the formats shown in the following table. Only those formats that apply to the selected chart type are available in the dialog box, and the available formats are shown in the dialog box in the selected chart type. The formats shown in the following table are for a column chart.

Format	Description
Side by side	Places each data marker within a category adjacent to the other data markers within the same category. You can set gap and overlap to any valid value.
Stacked	Measures the first series marker within a category starting from the x-axis, as usual, and then measures the value for the second series marker in that category from the top of the first series marker, the third series marker from the top of the second marker, and so on.
Stacked 100%	Stacks the values within a category the same as for a stacked format, but the values in each category are shown as percentages of the sum of all data points in the category, and add up to 100%. The actual values that the series represent do not appear on the chart, but the series themselves are not permanently altered by choosing this format.
3-D layout	For 3-D area, column, and line charts only. Plots the data series along the y-axis so each data series is in its own row.

Formatting data marker layout

To do the following procedure, you must be using full menus.

1 To format the data markers on the main chart, choose Format Main Chart.

To format the data markers on the overlay chart, choose Format Overlay.

2 Select the options you want to apply to your chart. The dialog box options are explained in the following table. Only those options that apply to the selected chart type are available in the dialog box.

3 Choose OK.

To	Do this
Change the chart type	In the Main Chart Type box or Overlay Chart Type box, select the chart type you want. Microsoft Excel retains any appropriate custom formats that you have already applied.
Specify a marker arrangement	Under Data View, select the arrangement you want from the available formats.
Change the overlap of bar chart or column chart markers within a category cluster	In the Overlap box, type a percentage value of overlap (do not include the % sign). The number you type is a percentage of the bar or column marker width.
Change the distance between category clusters of bar chart or column chart markers	In the Gap Width box, type a percentage value. The number you type is a percentage of the bar or column marker width.
Show each data marker in a different color pattern (only if the chart contains only one data series)	Turn on the Vary By Categories check box.
Add drop lines that extend from the highest value in each category to the x-axis (line and area charts only)	Turn on the Drop Lines check box.
Add hi-lo lines that extend from the highest to lowest value in each category (line and area charts only)	Turn on the Hi-Lo Lines check box.
Specify the angle at which you want the first pie slice to start (if the chart is a pie chart)	Type the angle in the Angle of First Pie Slice box. The angle is measured in degrees (clockwise from vertical).
Change the distance between the data series in a 3-D chart	Type a percentage value in the Gap Depth box. The number you type is a percentage of the marker width.
Change the depth of a 3-D chart relative to its width	Type a percentage value in the Chart Depth box. The number you type is a percentage of the chart width.

Formatting Marker Patterns

With the Format Patterns command, you can control the line or border style, color, and weight used for data markers and also the marker's pattern and foreground and background colors. For line charts, you can also control the marker shape. The options available in the Format Patterns dialog box vary depending on the type of marker you select. You can select and format all markers for the data series, or individual data markers within a data series.

You can create a wide variety of pattern and color combinations. You can apply colors even if you are using a monochrome monitor. On a monochrome monitor, the standard color names are shown in the Color list in the dialog box. Customized colors appear as Color 1, Color 2, and so on.

Formatting the border and area of data markers

Use the following procedure to format data markers that contain an enclosed area, such as area, bar, column, and pie chart data markers.

1 Select the marker or data series you want to format and choose Format Patterns, or double-click any marker in the series.

To format a single marker, hold down COMMAND and double-click the marker.

2 Select the border and area options you want.

Under Sample, Microsoft Excel shows you what the new formatting will look like. If you want Microsoft Excel to select the border or area options for you, turn on the Automatic option under Border or Area.

3 To apply your selected formats to all markers in the chart, turn on the Apply To All check box.

4 To invert the pattern of markers that correspond to negative numbers, turn on the Invert If Negative check box.

5 Choose OK.

Formatting line and scatter chart data markers

Use the following procedure to format the data markers and lines used in line or scatter charts.

1 Select the marker or data series you want to format and choose Format Patterns, or double-click any marker in the series.

To format a single marker, hold down COMMAND and double-click the marker.

2 Select the line and marker options you want.

Under Sample, Microsoft Excel shows you what the new formatting will look like. If you want Microsoft Excel to select the line or marker options for you, turn on the Automatic option under Line or Marker.

3 To apply your selected formats to all data markers in the chart, turn on the Apply To All check box.

4 Choose OK.

Clearing the data marker formats

1 Select the marker or data series you want to clear.

2 Choose Edit Clear.

3 Select the Formats option.

4 Choose OK.

If you selected a data series, the formatting for the series returns to the automatic formatting it originally had.

If you selected a single data marker with formatting different from the other markers in its series, Microsoft Excel formats that marker the same as the other markers in the series.

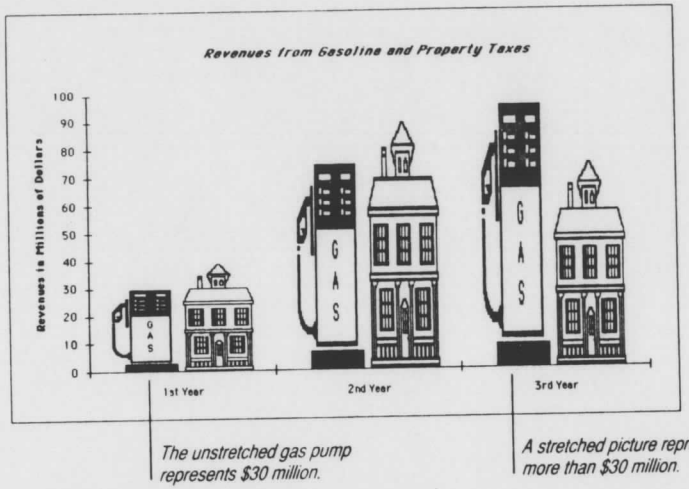
Creating and Formatting Picture Charts

You can copy a graphic from another application or a graphic drawn using Microsoft Excel drawing tools, and use that picture as the data series marker in an existing bar, column, or line chart. In a line chart, the picture is used in place of markers on the data series line. Your line chart must include markers in order to use a picture to mark the data points.

In a bar or column chart, you can choose whether you want Microsoft Excel to:

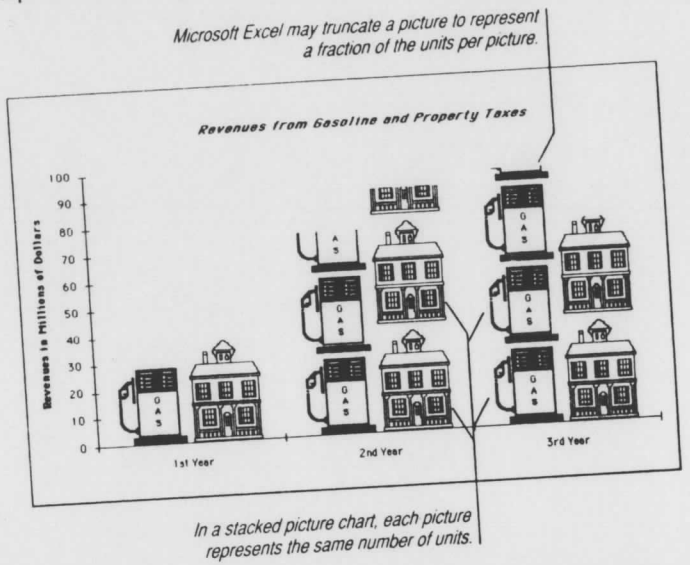
- Stretch or shrink the marker picture to show different values
- Stack copies of the marker picture to show larger values
- Stretch and shrink the marker picture to match a specified number of units and then stack scaled copies of the picture

The following illustration shows two markers being stretched to show larger values. The first gas pump represents $30 million; the first house represents $40 million:



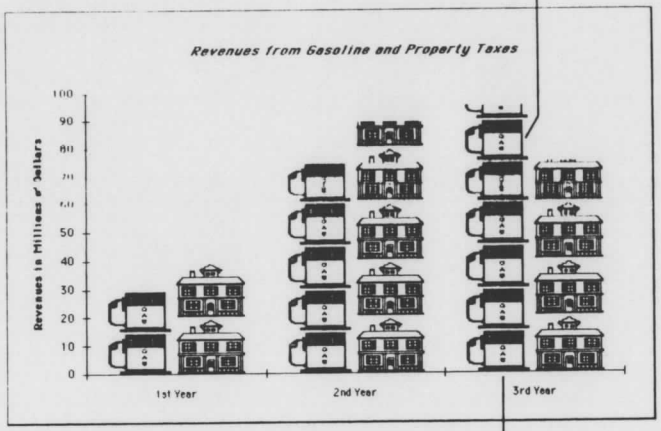
In a stacked picture chart, Microsoft Excel stacks copies of your pictures so that the total length is the same as a bar or column would be in a bar or column chart. The units each picture represents vary depending on the size of the picture and the scale of the value axis. Microsoft Excel may crop the last copy of the picture so that the marker is the correct length. The following illustration shows the same

chart, only with stacked pictures instead of stretched ones. Each gas pump represents $30 million; each house represents $40 million:



A stacked and scaled picture chart is similar to a stacked picture chart, except that each picture represents the number of units you specify and is resized (scaled) accordingly. The following illustration shows the same chart, except that each gas pump represents only $15 million, and each house represents only $20 million, so Microsoft Excel scales the picture markers by 50 percent and stacks twice as many of them in each column.

Each picture is scaled by 50 percent and represents half as many units...



...so twice as many pictures are required to plot the same values.

Replacing a data marker with a picture

Before adding a picture marker to a Microsoft Excel chart, you must first create the picture in another application or use the drawing tools on the tool bar. You must also create the chart because you will replace the normal Microsoft Excel data markers with your picture. Make sure the picture is an appropriate size; in general, try to make the width of your picture the same as the width of a normal data marker.

1. Activate the application and document containing the picture you want to use as a data series marker.
2. Copy the picture using the application's procedure for copying.

   If you are copying a graphic object from another Microsoft Excel document, choose Edit Copy.
3. Activate the Microsoft Excel chart in which you want to use the picture.
4. Select the marker or data series you want replaced by the picture.
5. Choose Edit Paste.

Changing whether a picture marker is stacked or stretched

You can specify whether Microsoft Excel stretches a single picture, stacks multiple copies of a picture, or stacks scaled copies of a picture to represent larger or smaller values in a bar or column chart. (In a line chart, you can format only the line itself; you cannot format the picture markers.)

Microsoft Excel automatically formats the picture to stretch if it is the first marker picture you copy into a bar or column chart. You can also paste other pictures to replace the data markers for other series in the same chart. Microsoft Excel formats any additional pasted pictures (as stacked or stretched) the same way you formatted the most recently formatted picture. You cannot overlap stacked pictures.

1. Select the picture marker or data series you want to format and choose Format Patterns, or double-click the marker or series.

   Microsoft Excel displays a dialog box asking which formatting option you want.
2. To stretch or shrink the picture to show different values, select the Stretch option.

   To stack copies of the picture to represent larger values, select the Stack option.

   To stack scaled copies of the picture, select the Stack And Scale option and type the units to use for each picture in the Units/Picture box.
3. To apply the formatting to all data markers in the chart, turn on the Apply To All check box.
4. Choose OK.

Clearing a data marker picture

Use the following procedure to clear the data marker picture you pasted and return the data markers to the normal column or bar shapes, or line symbols.

1. Select the marker or data series whose picture you want to clear.
2. Choose Edit Clear.
3. Select the Formats option.
4. Choose OK.

   If you selected a data series, Microsoft Excel removes the picture, and the formatting for the series returns to the automatic formatting it originally had.

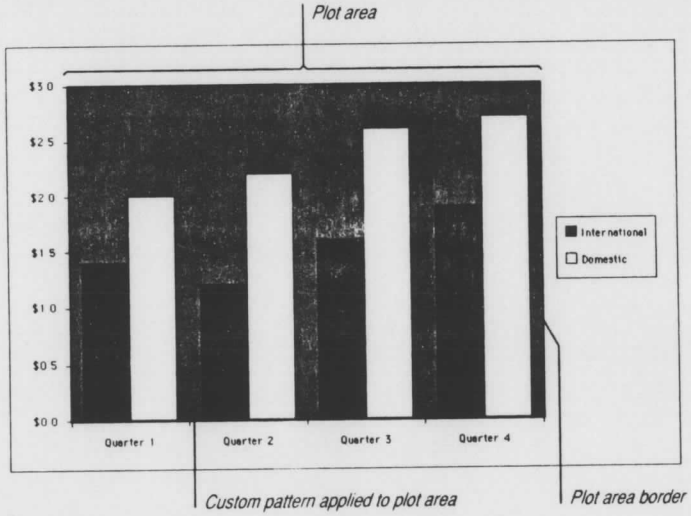
   If you selected a single data marker with a picture different from the other markers in the series, Microsoft Excel formats that marker the same as the other markers in the series.

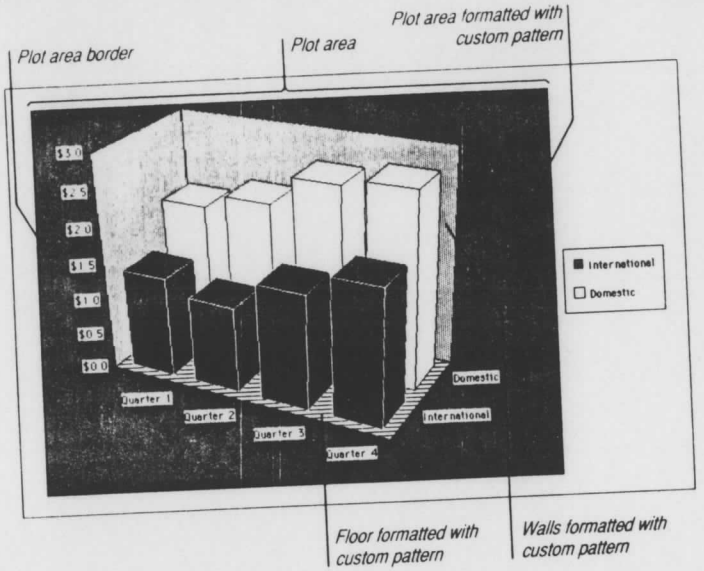
Formatting the Plot Area

The plot area is the area bounded by and including the x-axis and y-axis on a 2-D chart and the area enclosing the axes, axes labels, and axes titles on a 3-D chart. You can control the fill colors and pattern for the plot area as well as the line style, color, and weight used for the plot area borders. In a 3-D chart, you can format the walls behind the data series markers and the floor of the chart as well as the entire plot area.

You can apply colors even if you are using a monochrome monitor. On a monochrome monitor, the standard color names are shown on the Color list in the dialog box. Customized colors are labeled as Color 1, Color 2, and so on.

The following illustrations show the plot area for a 2-D and a 3-D chart:





Online Help also provides information on formatting the plot area. To display online Help, choose the Window Help command. If you are using system software version 7.0 and the Help command does not appear on the Window menu, display Help by pointing to the Help menu icon and choosing the Microsoft Excel Help command. For information on a specific command, select the Commands topic. For information on using online Help, see "Using Help" in Chapter 1.

NOTE If you are formatting a chart that was embedded on a worksheet or macro sheet with the chart tool, you must open the chart before performing the procedures in this section. To open the chart, double-click it. An open chart appears in its own document window, and you can move it, size it, and close it as you would any document window. You can also activate it from the Window menu. For more information, see "Opening an Existing Chart" in Chapter 12.

Selecting the plot area

- ▶ Click any part of the plot area not occupied by another chart item or choose Chart Select Plot Area.

- ▶ Use the UP ARROW or DOWN ARROW key to move through the chart items until the plot area is selected or choose Chart Select Plot Area.

Selecting the walls or floor in a 3-D chart

- ▶ Click any part of the walls or floor not occupied by another chart item.

- ▶ Use the UP ARROW or DOWN ARROW key to move through the chart items until the walls or floor are selected.

Formatting the plot area, 3-D walls, or 3-D floor

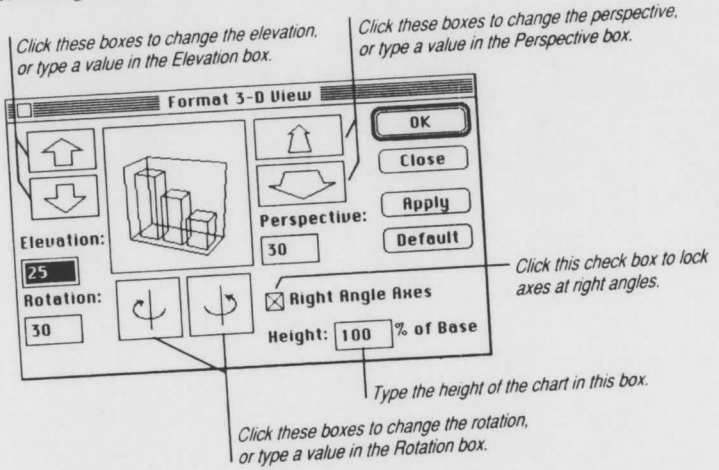
1. Select the plot area, 3-D walls, or 3-D floor and choose Format Patterns, or double-click the plot area, walls, or floor.
2. Select the border and area options you want.

   Under Sample, Microsoft Excel shows you what the new formatting will look like. If you want Microsoft Excel to select the border or area options for you, turn on the Automatic option under Border or Area.
3. Choose OK.

Formatting the 3-D Chart View

In a 3-D chart, you can control the elevation, rotation, perspective, height and angle of the axes with the Format 3-D View command. By adjusting these options you can change the chart to best display the data you're working with.

When you choose the Format 3-D View command, Microsoft Excel displays the following dialog box:


Click these boxes to change the elevation, or type a value in the Elevation box.
Click these boxes to change the perspective, or type a value in the Perspective box.
Format 3-D View
OK
Close
Apply
Default
Elevation:
25
Perspective:
30
Rotation:
30
Right Angle Axes
Height:
100
% of Base
Click this check box to lock axes at right angles.
Type the height of the chart in this box.
Click these boxes to change the rotation, or type a value in the Rotation box.

The sample chart in the dialog box shows the result of changes as you make them.

- **Elevation** Controls the height at which you view the data. For all 3-D charts except 3-D pie charts, the elevation is measured in degrees and can range from –90 to 90. An elevation of zero displays the chart as if you were level with the center of the plot area; an elevation of 90 displays the chart as you would view it from above the center of the plot area; and an elevation of –90 displays the chart as you would view it from below the center of the plot area. For 3-D pie charts, the elevation can range from 10 to 80 degrees. A lower elevation displays the chart as if you were looking more from the edge of the pie chart—you see more of each pie slice's thickness. A higher elevation displays the chart as if you were looking more from above—you see more of the pie chart's circular surface.

- **Perspective** Controls the amount of perspective. More perspective makes data markers at the back of the chart smaller than data markers at the front of the chart, providing a sense of distance to the data markers farther away. You may want to use a greater perspective when the chart contains a lot of data, so data markers at the back of the chart appear more in proportion relative to data markers near the front of the chart. The perspective value specifies the ratio of the front of the chart to the back of the chart and can range from zero to 100. A perspective of zero makes the farthest edge of the plot area equal in width to the nearest edge of the plot area—that is, no perspective.
- **Rotation** Controls the rotation of the plot area around the z-axis (vertical axis). The rotation is measured in degrees and can range from 0 to 360. A rotation of zero displays the chart as you would view it from the front, or the center of the x-axis, and a rotation of 180 displays the chart as you would view it from the opposite side, or the back, visually reversing the plot order of the data series. A rotation of 90 displays the chart as you would view it from the center of the side.
- **Right Angle Axes** Controls the orientation of the axes. Turn on the check box to show axes at right angles to each other. Turn off the check box to show axes in perspective. If this check box is turned on, you cannot specify the perspective for the 3-D view.
- **Height** Controls the height of the z-axis and walls relative to the length of the x-axis, or width of the base of the chart. The height is measured as a percentage of the x-axis length. A height of 100 percent makes the height equal to the x-axis length, a height of 50 percent makes the height half the x-axis length, and a height of 200 percent makes the height twice the x-axis length. If you change this setting, the change is not reflected in the sample chart shown in the dialog box.

Online Help also provides information on formatting the 3-D chart view. To display online Help, choose the Window Help command. If you are using system software version 7.0 and the Help command does not appear on the Window menu, display Help by pointing to the Help menu icon and choosing the Microsoft Excel Help command. For information on a specific command, select the Commands topic. For information on using online Help, see "Using Help" in Chapter 1.

NOTE If you are formatting a chart that was embedded on a worksheet or macro sheet with the chart tool, you must open the chart before performing the procedures in this section. To open the chart, double-click it. An open chart appears in its own document window, and you can move it, size it, and close it as you would any document window. You can also activate it from the Window menu. For more information, see "Opening an Existing Chart" in Chapter 12.

Adjusting the 3-D chart view

In the Format 3-D View dialog box, a sample chart shows the result of the changes as you make them.

1. Choose Format 3-D View.
2. In the Elevation, Perspective, and Rotation boxes, type the values you want or click the arrows to adjust the elevation, perspective, and rotation.
3. To show axes at right angles to each other, turn on the Right Angle Axes check box.

   To show axes in perspective, turn off the Right Angle Axes check box.
4. In the Height box, type the percent of the x-axis length you want used as the height of the chart.
5. To apply your changes and close the dialog box, choose OK.

   To apply your changes to the chart but leave the dialog box open so you can continue to adjust the chart, choose the Apply button.

   To reset the view options to the default for the gallery format, choose the Default button.

Printing a Chart

This section provides a summary of the printing procedure. For detailed information on choosing and setting up a printer, setting up your pages, and previewing a document, see Chapter 15, "Printing."

Before printing a chart:

- Use the Chooser command on the Apple menu to choose the printer you want to use.
- Use the File Page Setup command to add headers and footers and to set the printed chart size, page margins, whether or not the chart is centered vertically or horizontally, the orientation of the chart on the paper, and other printer-specific options.
- Preview the chart to make sure it will print the way you want by choosing File Print Preview or by choosing File Print, turning on the Page Preview check box, and choosing OK.

Online Help also provides information on printing a chart. To display online Help, choose the Window Help command. If you are using system software version 7.0 and the Help command does not appear on the Window menu, display Help by pointing to the Help menu icon and choosing the Microsoft Excel Help command. For information on a specific command, select the Commands topic. For information on using online Help, see "Using Help" in Chapter 1.

Printing a chart

1 If the chart is embedded in a worksheet or macro sheet, double-click the chart to open it in its own chart window.

   If the chart is a separate document in its own window, activate the chart window.

2 Choose File Print.

3 Type the number of copies you want to print.

4 To preview the chart on the screen before printing, turn on the Print Preview check box.

5 Choose the Print button.

   Microsoft Excel displays a message indicating it is printing your document; if you want to cancel printing, press COMMAND+PERIOD.

MORE ABOUT

More About Printing a Chart

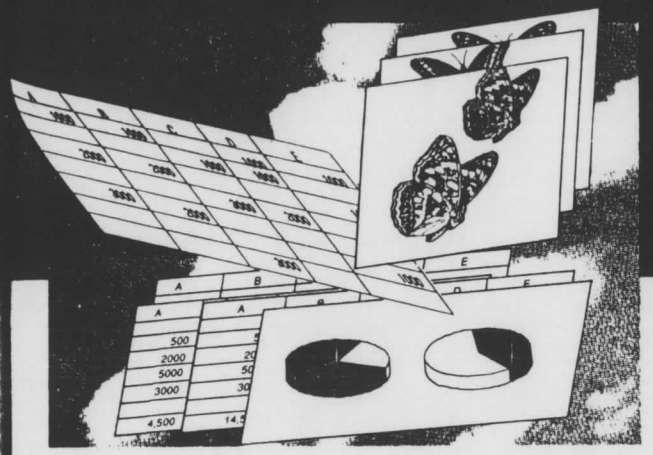
Guideline

Additional Page Setup Options for Charts The File Page Setup dialog box for charts includes an additional set of size options that are not available for worksheets or macro sheets. The size options determine how Microsoft Excel fits the chart within the margins on the printed page.

Size option	Description
Screen Size	Prints the chart the same size as is currently shown on the screen.
Fit to Page	Prints the chart as large as possible while retaining the height-to-width ratio shown on the screen.
Full Page	Prints the chart to fit the entire page, regardless of the height-to-width ratio shown on the screen.

Troubleshooting

Printing a 3-D Chart on an Electronic Plotter Microsoft Excel may not be able to print your 3-D chart on an electronic plotter. If you encounter problems printing a 3-D chart on a plotter, format the chart as a 2-D chart or use a regular printer.



Creating Reports and Printing

Part 5 Table of Contents

Chapter 14 Using Graphics on Microsoft Excel Worksheets ... 499
Creating lines and shapes on a worksheet by using the drawing tools on the tool bar. Selecting, formatting, and deleting lines and shapes. Exchanging graphics with other applications. Combining charts, worksheets, and macro sheets.

Chapter 15 Printing ... 525
Setting up your printer and pages. Previewing and changing pages before printing.

Using Graphics on Microsoft Excel Worksheets

With Microsoft Excel, you can draw graphics, such as lines, ovals, arcs, and rectangles, and you can import graphics as pictures from other applications to enhance the appearance of your Microsoft Excel worksheets or macro sheets. You can combine Microsoft Excel charts with worksheets or macro sheets to create integrated reports. In addition, you can export pictures of Microsoft Excel charts or worksheet or macro sheet cells to other applications. You can draw macro buttons that run macros when they are clicked, and you can assign macros to other graphic objects too.

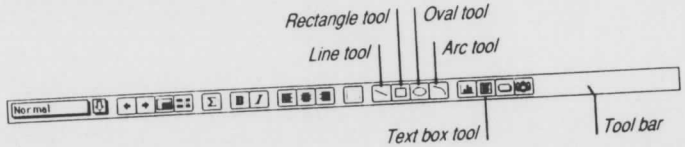
NOTE Unless otherwise noted, all information and procedures for working with worksheets also apply to macro sheets.

Table of Contents

Drawing Lines and Shapes ... 499
Working with and Formatting Graphic Objects ... 502
Deleting a Graphic Object ... 517
Combining Charts, Worksheets, and Macro Sheets ... 518
Exchanging Graphics with Other Applications ... 521

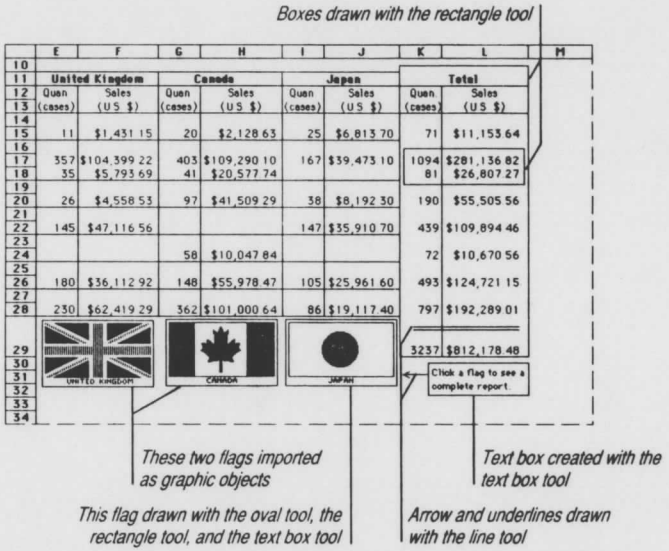
Drawing Lines and Shapes

When producing reports or creating templates or models for others to use, you may want to add lines, shapes, or other objects to your documents to emphasize certain information or to enhance the appearance of your documents. You can draw lines, ovals, rectangles, and arcs on a worksheet or macro sheet using the drawing tools on the *tool bar*. The lines and shapes you draw with the drawing tools are *graphic objects*. If your workspace is set to display the tool bar, it is displayed below the menu bar. You can use the tool bar only if you have a mouse installed on your computer.



By adding arrowheads to lines, you can use them as pointers to cells, other graphic objects, or copied pictures. You can also fill ovals, rectangles, and arcs with a color and a pattern to help attract attention to certain areas of the document.

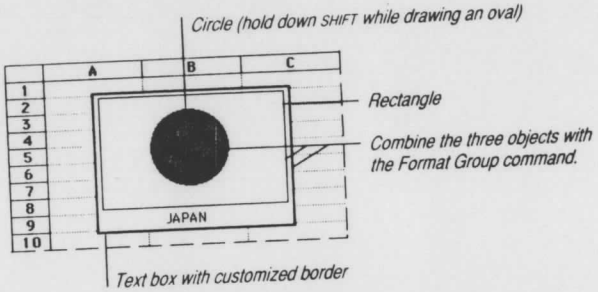
The following illustration shows some examples of graphic objects on a worksheet:


Boxes drawn with the rectangle tool
United Kingdom
Canada
Japan
Total
Quan (cases)
Sales (US $)
11 $1,431 15 20 $2,128 63 25 $6,813 70 71 $11,153 64
357 $104,399 22 403 $109,290 10 167 $39,473 10 1094 $281,136 82
35 $5,793 69 41 $20,577 74 81 $26,807 27
26 $4,558 53 97 $41,509 29 38 $8,192 30 190 $55,505 56
145 $47,116 56 147 $35,910 70 439 $109,894 46
58 $10,047 84 72 $10,670 56
180 $36,112 92 148 $55,978 47 105 $25,961 60 493 $124,721 15
230 $62,419 29 362 $101,000 64 86 $19,117 40 797 $192,289 01
3237 $812,178 48
UNITED KINGDOM
CANADA
JAPAN
Click a flag to see a complete report.
These two flags imported as graphic objects
Text box created with the text box tool
This flag drawn with the oval tool, the rectangle tool, and the text box tool
Arrow and underlines drawn with the line tool

When working with graphic objects, keep in mind the following general guidelines:

- **Drawing an arc** When you draw an arc, Microsoft Excel draws a curve that is equivalent to a quarter of an oval. As you draw the arc, you can vary its size and elongation.
- **Controlling angles and shapes** You can control the line angle and the shape of ovals, rectangles, buttons, text boxes, charts, and arcs by holding down SHIFT while you draw the graphic object. Holding down SHIFT restricts lines to vertical, horizontal, or 45-degree angles; restricts ovals to circles; restricts rectangles to squares; and restricts arcs to circle segments.

- **Combining objects into a single picture** You can draw several pictures and then combine them into a single picture. For example, the Japanese flag in the following illustration is drawn by separately drawing a circle with the oval tool, a rectangle with the rectangle tool, and a text box with the text box tool. Use the Format Bring To Front and Format Send To Back commands to position the objects on top of each other in the correct order. Then use the Format Group command to combine the three objects into a single object. For more information, see the following section, "Working with and Formatting Graphic Objects."



- **Aligning objects to the cell gridlines** When you draw an object on a worksheet or macro sheet, you can have Microsoft Excel align the object to the cell gridlines so the object's borders don't fall in the middle of cells. Aligning objects to gridlines is an easy way to make sure several objects line up horizontally or vertically. To have Microsoft Excel align a graphic object to the cell gridlines, hold down the COMMAND key while you draw, move, or size a graphic object. If you release the COMMAND key while drawing, you can then draw, move, or size the graphic object between the gridlines.

Drawing a line, oval, rectangle, or arc

1. Click the drawing tool you want.

   The mouse pointer changes to a cross hair.
2. Position the cross-hair pointer where you want to start drawing the graphic object.
3. To restrict lines to horizontal, vertical, or 45-degree angles; ovals and arcs to circles; or rectangles to squares, hold down SHIFT.

   Or to align the object with the cell gridlines, hold down COMMAND.
4. Drag until the object is the size and shape you want.

   When you release the mouse button, the graphic object is automatically selected.

Drawing multiple lines, ovals, rectangles, or arcs

You can draw multiple lines or shapes of the same kind sequentially without having to select the drawing tool each time you want to start drawing.

1. Hold down COMMAND and click the drawing tool you want.
2. Draw the first graphic object.

   When you release the mouse button, the same drawing tool stays selected and the pointer remains a cross hair.
3. Draw additional objects of the same kind.
4. When you finish drawing the last object, cancel the drawing tool selection by clicking the same tool again.

   You can also cancel the drawing tool selection by pressing ESC or clicking another part of the worksheet without dragging.

MORE ABOUT

More About Drawing Lines and Shapes

Tips

Canceling the Tool Selection If you select a tool and then decide not to use it, you can cancel the current tool selection by clicking anywhere in the document window without dragging, by clicking another tool, or by pressing COMMAND+PERIOD.

Hiding the Tool Bar You can hide or display the tool bar by choosing the Options Workspace command and turning off or turning on the Tool Bar check box. You can also turn the tool bar display on or off by pressing COMMAND+7.

Working with and Formatting Graphic Objects

Once you have added a graphic object, either by drawing it with the drawing tools or importing it as a picture from another document, you can change its position or size, group it with other graphic objects, duplicate it within the document, and format the border, color, and pattern of the object. The term "graphic object" refers to drawn lines and shapes as well as text boxes, buttons, charts embedded on a worksheet or macro sheet, pictures of other Microsoft Excel documents, and imported pictures and graphics.

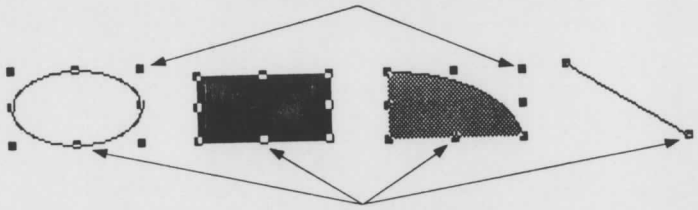
For information on	See
Adding text boxes	"Adding Comments to a Worksheet" in Chapter 6
Creating a chart on a worksheet or macro sheet	"Creating a New Chart" in Chapter 11
Pasting a picture of worksheet or macro sheet cells or a chart in another Microsoft Excel document	"Combining Charts, Worksheets, and Macro Sheets" later in this chapter
Importing graphics from other applications	"Exchanging Graphics with Other Applications" later in this chapter

Online Help also provides information on working with and formatting graphic objects. To display online Help, choose the Window Help command. If you are using system software version 7.0 and the Help command does not appear on the Window menu, display Help by pointing to the Help menu icon and choosing the Microsoft Excel Help command. For information on a specific command, select the Commands topic. For information on using online Help, see "Using Help" in Chapter 1.

Selecting a Graphic Object

To change a graphic object after you have created it—for example, to move, size, or format an object—you must first select it. Microsoft Excel offers several ways to select an object. When an object is selected, small black squares called *handles* appear on the borders of the object. For a line, the handles appear only at the ends of the line. The handles are attached to an invisible *frame*. For a rectangle or line, the frame is the same as the rectangle's border or the line itself, but for an arc or oval, the frame is an invisible rectangle surrounding the object.

Handles lie on an invisible frame.



Handles surround selected objects.

When you select a graphic object, Microsoft Excel displays the object identifier in the reference area in the left side of the formula bar where the cell reference is usually displayed. The object identifier includes the graphic object's type, such as "Rectangle" or "Picture," followed by the number assigned to the object by Microsoft Excel when it was created.

Selecting a graphic object

You can select an object only when the mouse pointer appears as an arrow. The mouse pointer changes to an arrow when it's over a solid object, or when it's over the border of a transparent object, or the border of a text box or button in which the text is selected.

▶ Click the graphic object.

Microsoft Excel displays handles around the graphic object.

If the handles don't appear, the graphic object is not selected. Make sure the tip of the mouse pointer is over the graphic object and click again.

Selecting multiple graphic objects with the mouse pointer

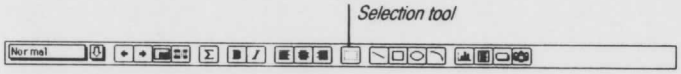
1 Click the first graphic object.

2 Hold down SHIFT and click another object.

3 Repeat step 2 until you have selected all the objects you want.

Selecting multiple graphic objects with the selection tool

If you want to select several graphic objects in the same area of the document, you may find it easier to use the selection tool on the tool bar, rather than clicking each graphic object. With the selection tool you can select all the objects in an area with a single action.



1 Click the selection tool.

To select multiple areas without having to reselect the selection tool each time, hold down COMMAND and click the selection tool.

2 Point to one corner of the area you want to select.

3 Drag until the selection rectangle encloses all the objects you want to select. An object must be entirely enclosed in the selection rectangle to be selected.

When you release the mouse button, Microsoft Excel selects all the objects within the selection rectangle and displays handles around each of the objects.

4 If you held down COMMAND when you selected the selection tool, hold down SHIFT and repeat steps 2 and 3 to add another area to the selection.

If you didn't hold down COMMAND when you selected the selection tool, you can add another area to the selection by clicking the selection tool again, holding down SHIFT, and dragging through another area.

Selecting all graphic objects

You can select all graphic objects on your worksheet or macro sheet at the same time. This is useful if you want a particular action, such as formatting, clearing, or grouping, to affect all graphic objects, and if your worksheet contains several objects that are not near each other.

To do this procedure, you must be using full menus.

1 Choose Formula Select Special.

2 Select the Objects option.

3 Choose OK.

Selecting a graphic object with a macro assigned to it

Selecting a graphic object with a macro assigned to it is slightly different than selecting other graphic objects, because normally when you click the object, the macro runs.

▶ Hold down COMMAND and click the graphic object.

You can also just use the selection tool to enclose the object within the selection rectangle.

Removing a graphic object from the selection

If you accidentally select a graphic object that you don't want selected, or if you use the selection tool to select an area and the area includes some objects you don't want selected, you can remove the individual objects from the selection without affecting the rest of the selection.

▶ Hold down SHIFT and click the graphic object you don't want selected.

To remove a group of objects from the selection, select the selection tool, hold down SHIFT, and enclose the objects in the selection rectangle.

Grouping and Separating Graphic Objects

You can group the selected graphic objects into a single graphic object so that when you select one object in the group, the entire group is selected. The group of objects can then be moved and sized as one object. This is useful, for example, if you have already positioned the objects and you want to move them without disturbing their relative positions. It is also faster than moving the objects one at a time. Objects in the group cannot be edited, formatted, moved, or sized individually until you separate them.

Grouping graphic objects

To do this procedure, you must be using full menus.

1. Select the graphic objects you want to group together.
2. Choose Format Group.

Separating grouped graphic objects

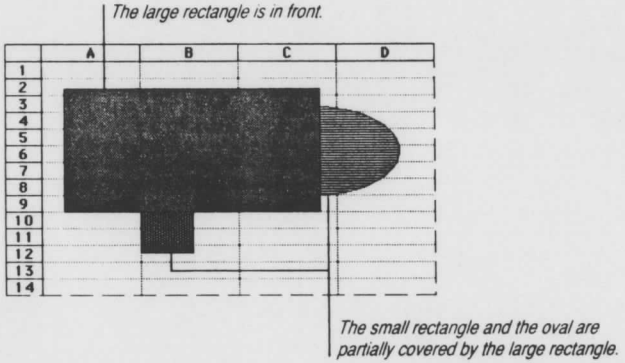
To do this procedure, you must be using full menus.

1. Click any graphic object in the group.
2. Choose Format Ungroup.

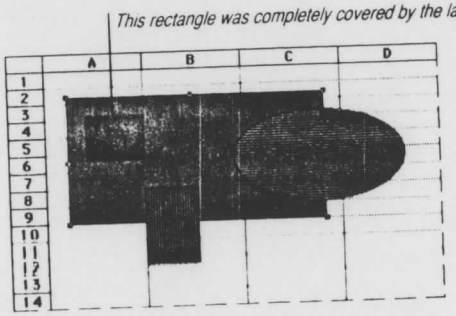
All the objects that were in the group are now individual objects again, and they are all selected as individual objects. If you want to work with only one object in the group, make sure that only that object is selected before performing any actions or choosing any commands (an easy way to do this is to click any cell and then click the object you want to select).

Reordering Overlapped Graphic Objects

When graphic objects overlap, some objects may be partially or completely covered by the objects in front of them. If an object is completely hidden by other objects, you cannot select it. You can change which objects are in front of other objects with the Format Bring To Front and Format Send To Back commands. The following illustrations show the result of moving an object from the front to the back:



After selecting the large rectangle and sending it to the back, you can see all of the small rectangle and oval. Also, you can see another rectangle that was completely covered by the large rectangle:



NOTE With the mouse, you cannot select cells that are completely covered by a graphic object unless the object has the invisible fill pattern so that the cells are still visible through the object. If the cells are not visible, you must use the keyboard to move through and select the covered cells. However, you can click a cell that is only partially covered by an object and then drag to select cells underneath the object.

Changing the order of overlapped graphic objects

To do this procedure, you must be using full menus.

1. Select the graphic object or objects you want to bring to the front or send to the back.
2. To place the selected objects in front of the other objects, choose Format Bring To Front.

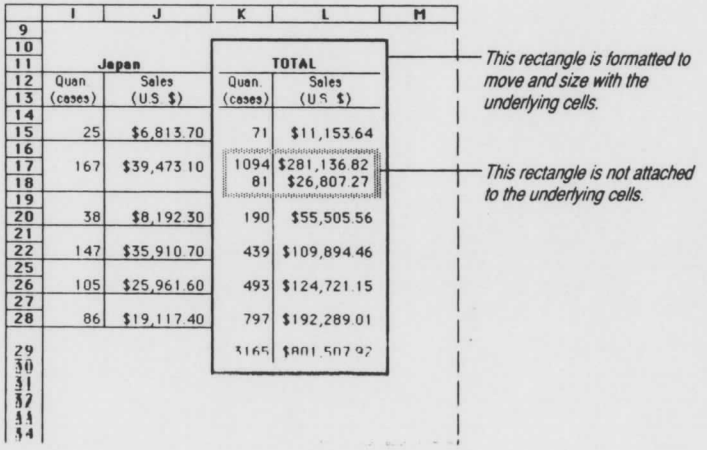
   To place the selected objects behind the other objects, choose Format Send To Back.

Detaching a Graphic Object from Its Underlying Cells

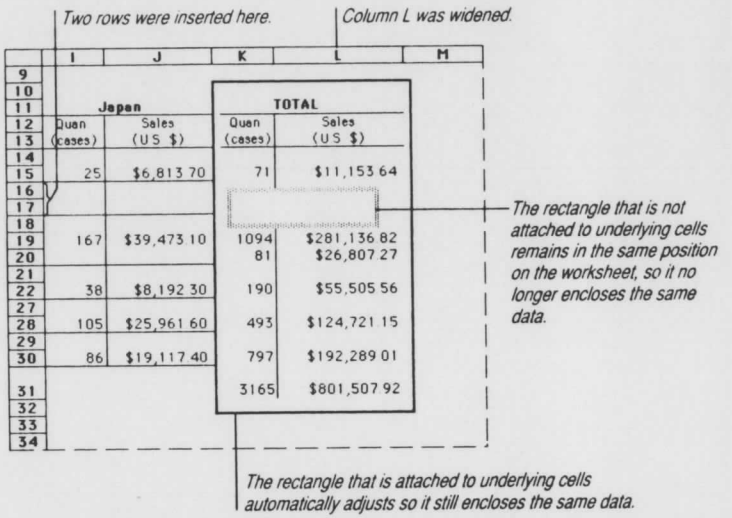
A graphic object on a worksheet or macro sheet is normally attached to the underlying cells so that the object automatically moves or changes size when the underlying cells shift due to changes in row height or column width, or the insertion or deletion of cells.

Objects that are not attached to the underlying cells remain the same size and in the same position regardless of shifts in the cells that the object overlaps. You may want to attach objects to cells if you always want the objects to maintain their size position relative to the cells beneath them; if the objects are not attached, you must move or resize them yourself if the underlying cells shift or change size. You can also specify that objects move but not change size when cells shift or change size.

The following illustrations show the difference between an object that is attached to underlying cells and one that is not. The objects in this example are rectangles. (Using rectangles instead of cell borders is useful for creating borders that don't match the cell grid.)



If you widen a column or insert a row, the rectangles adjust differently depending on whether or not they are attached to their underlying cells.


Two rows were inserted here.
Column L was widened.
Japan
TOTAL
Quan (cases)
Sales (US $)
Quan (cases)
Sales (US $)
25 $6,813.70 71 $11,153.64
167 $39,473.10 1094 $281,136.82
81 $26,807.27
38 $8,192.30 190 $55,505.56
105 $25,961.60 493 $124,721.15
86 $19,117.40 797 $192,289.01
3165 $801,507.92
The rectangle that is not attached to underlying cells remains in the same position on the worksheet, so it no longer encloses the same data.
The rectangle that is attached to underlying cells automatically adjusts so it still encloses the same data.

Initially, all graphic objects, except pictures imported from other applications, are formatted to both move and change size with the underlying cells when you first create them. Imported pictures are formatted only to move with cells. You can change whether an object is attached with the Format Object Placement command. Moving or sizing an attached object does not affect any cells.

NOTE Copying or moving cells with the Edit Copy and Edit Cut commands does not affect the position of attached graphic objects, because copying and cutting affects only the contents of cells and does not change the cell structure.

Controlling the way a graphic object is moved or sized

To do this procedure, you must be using full menus.

1. Select the graphic object whose placement you want to change.
2. Choose Format Object Placement.
3. To format the object so it maintains a position and size relative to the cells under its upper-left and lower-right corners, select the Move And Size With Cells option.

   To format the object so it moves with the cell under its upper-left corner, but does not change size when the distance changes between the cells under its upper-left and lower-right corners, select the Move But Don't Size With Cells option. This is useful for pictures since they may become distorted when resized.

   To format the object so it is detached from the cell grid, select the Don't Move Or Size With Cells option.
4. Choose OK.

Sizing, Moving, and Copying a Graphic Object

You can move or size a graphic object by dragging the object or its handles with the mouse. You can also move or copy a graphic object by cutting or copying it and then pasting it. If you cut or copy an object and then paste it, you can control where it is pasted on a worksheet or macro sheet by selecting a cell or object where you want to paste the object.

When you move or size a graphic object with the mouse, you can align it to the cell gridlines on the worksheet or macro sheet by holding down the COMMAND key while dragging the object or its handles. If you release the COMMAND key while you are dragging, you can then place the graphic object between the gridlines.

Sizing a graphic object

You can size graphic objects in one dimension at a time—horizontal or vertical—or you can size an object in both dimensions at the same time. To size an object in only one dimension, you use the handles that appear in the middle of one of the sides. To size an object in two dimensions at once, you use the handles that appear in the corners. If you select more than one object, dragging the handles of one object sizes all selected objects proportionally and in the same dimensions at the same time.

1. Select the graphic object or objects you want to size.
2. Position the mouse pointer over a handle.

   The pointer turns into a cross hair when it is over a handle.
3. Drag the handle to create the new dimensions you want. To keep the object's horizontal and vertical dimensions proportional, hold down SHIFT and drag a corner handle.

   Or to align the object frame to the cell grid, hold down COMMAND.

As you drag, a dotted outline shows the new dimensions. When you release the mouse button, Microsoft Excel draws the objects in their new size.

NOTE When you size a picture, the scaling proportions appear in the reference area of the formula bar. The size of the picture when it is first pasted is 100%.

Moving a graphic object by dragging

1. Position the mouse pointer on the object. If the object is transparent or is a text box or button in which text is selected, position the pointer on the object's border.

   The pointer must be an arrow. If the pointer is a cross hair, you will size the object instead of moving it. To move more than one object, use the selection tool to first select the objects you want to move.
2. Drag the object or objects to the new position.

   To move the objects only horizontally or vertically, hold down SHIFT while you drag.

   To align the objects with the cell grid, hold down COMMAND while you drag.

As you drag, a dotted outline shows the new location of all the selected objects. If you drag the objects to the edge of the window, Microsoft Excel automatically scrolls the worksheet. When you release the mouse button, Microsoft Excel draws the objects in the new position.

Moving a graphic object by cutting and pasting

If you want to move a graphic object to another Microsoft Excel document, use the Edit Cut and Edit Paste commands. Also, if you want to move an object a long distance on the same worksheet or macro sheet, you may want to cut and paste the object rather than dragging it and scrolling through the document to get to the new location. If you select and move more than one object at a time, the objects maintain the same relative positions when pasted in the new location.

1. Select the graphic object or objects you want to move.
2. Choose Edit Cut.
3. If you want to move the objects to another document, activate the other document.
4. Select a cell or object where you want the copy pasted.
5. Choose Edit Paste.

Copying a graphic object

You can copy a graphic object to a new location in the same document or to another document using the Edit Copy and Edit Paste commands. You can copy an individual object or you can copy several objects together. When you copy several objects, they are copied as individual objects, but they maintain their relative positions when pasted in the new location.

1. Select the graphic object or objects you want to copy.
2. Choose Edit Copy.
3. If you want to copy the objects to another document, activate the other document.
4. Select a cell or object where you want the copy pasted.
5. Choose Edit Paste.

Assigning a Macro to a Graphic Object

You can assign a macro to a graphic object so that the macro will run whenever you click the object. Later, if you want to select the object without running the macro, hold down the COMMAND key while you click the object.

Assigning a macro to a graphic object

Before assigning a macro to an object, you should open the macro sheet containing the macro you want to assign.

To do this procedure, you must be using full menus.

1. Click the object.
2. Choose Macro Assign To Object.
3. In the Assign Macro box, select the macro you want to assign, or enter the name of the macro as an external reference in the Reference box.
4. Choose OK.

For more information, see "Assigning a Command Macro to a Button or Other Graphic Object" in Chapter 18.

Formatting a Graphic Object

You can format the border and the fill pattern of a graphic object with the Format Patterns command. The Format Patterns dialog box differs slightly depending on the object selected. For example, for rectangles and text boxes, you can choose to use shadowed borders or rounded corners. For lines, you can add and format an arrowhead, which is useful for calling out important information in specific cells. Since lines do not have a fill area, the Format Patterns dialog box does not include options for formatting the fill pattern if a line is selected.

Formatting an object's border and fill pattern

To do this procedure, you must be using full menus.

1. Select the graphic object or objects you want to format and choose the Format Patterns command. Or, except for an embedded chart or linked picture, you can just double-click an object to select it and display the Format Patterns dialog box.

   If a macro has been assigned to an object, hold down COMMAND while you click or double-click the object. The COMMAND key prevents the macro from running. You can also use the selection tool to select the object without running the macro.

   If the object is a picture linked to another document, double-clicking the object opens the source document and selects the range the picture is linked to. To format a linked object, you must format the source document.

2. Select the border and fill options you want.

   If you want Microsoft Excel to select the border and fill options for you, select the Automatic option under Border and Fill.

3. To apply the selected formats and close the dialog box, choose OK.

   If you are formatting a text box, you can choose the Font button to apply the selected formats, close the Format Patterns dialog box, and open the Format Font dialog box so you can change the size or style of the font used in the text box. Or choose the Text button to apply the selected formats, close the Format Patterns dialog box, and open the Format Text dialog box so you can change the alignment or orientation of the text.

Formatting a line

Follow this procedure to format both lines and arrows; arrows are lines formatted to have an arrowhead.

1. Click the line you want to format and choose the Format Patterns command, or double-click the line.

   If a macro has been assigned to the line, hold down COMMAND while you click or double-click the line. The COMMAND key prevents the macro from running. You can also use the selection tool to select the line without running the macro.

2. Select the line options you want.

   If you want Microsoft Excel to select the line options for you, select the Automatic option under Line.

3. If you want to make the line an arrow, select the arrowhead options you want.

   If you want a line instead of an arrow, do not select any arrowhead options. If you want to format an existing arrow as a normal line, select the style without an arrowhead under Arrow Head.

4. Choose OK to apply the selected formats and close the dialog box.

MORE ABOUT

More About Working with and Formatting Graphic Objects

Tips

Locking a Graphic Object You can lock a graphic object with the Format Object Protection command so that it cannot be selected, moved, sized, or formatted. First, select the object, choose Format Object Protection, and turn on the Locked check box. Then, when you choose Options Protect Document and turn on the Objects check box, Microsoft Excel locks the objects to which you applied the Locked option. Objects attached to the cell grid will be moved and sized as usual. For more information on locking graphic objects, see "Protecting Documents and Windows" in Chapter 16.

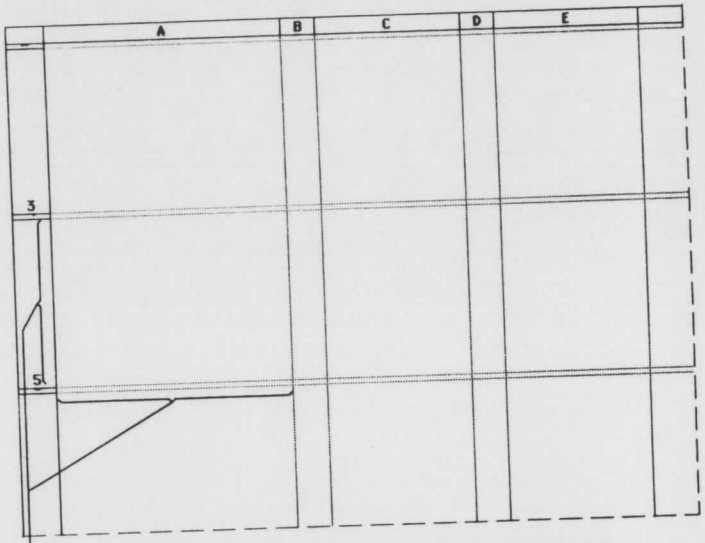
Hiding Graphic Objects On a worksheet or macro sheet, you can speed up scrolling by hiding all graphic objects or displaying placeholders for embedded charts and pictures. Hiding objects may also make it easier to view and edit the underlying document. To hide objects or display placeholders, choose the Options Display command. Select the Show Placeholders option to display gray rectangles in place of embedded charts and pictures, or select the Hide option to hide all objects. You can use the keyboard to switch between displaying all objects, displaying placeholders, or hiding objects by pressing COMMAND+6.

Copying a Graphic Object with the Mouse Instead of using the Edit Copy and Edit Paste commands to copy a graphic object in the same document, you can hold down OPTION and drag the object. Microsoft Excel creates a copy of the object and moves it to the new position. The original object remains unchanged.

Creating a Layout Grid On a worksheet or macro sheet, you can also use the cell gridlines to create a custom layout grid for the document layout. A layout grid is any worksheet that you have customized for a page layout. By formatting row heights and column widths, you can create a custom grid to which you can align

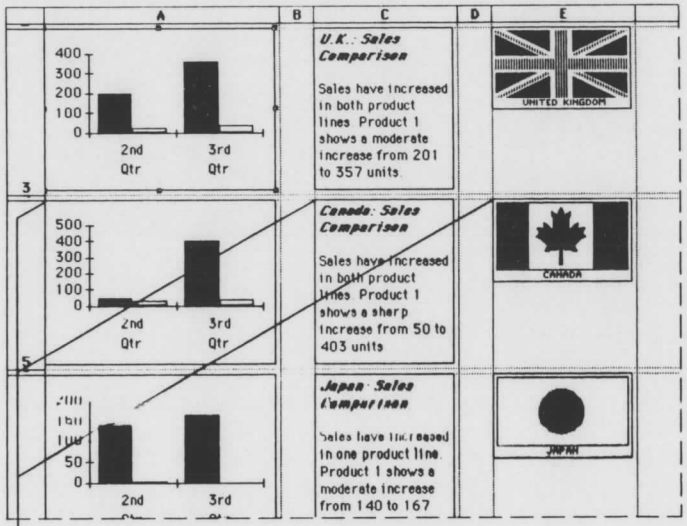
MORE ABOUT

graphic objects by holding down COMMAND as you move or size them. This ensures that graphic objects and information are always positioned correctly throughout the document as shown in the following illustrations:



Format row heights and column widths to align graphic objects you'll import later.

MORE ABOUT



This grid is set up for three objects—a chart, a text box, and an imported flag. Objects can be positioned to align exactly with the grid.

Troubleshooting

Verifying That the Graphic Object Is Selected If you click or drag a graphic object or one of its handles, and the object does not become selected, or move or change size, then you may not have selected the object. Make sure the pointer is the correct shape before clicking or dragging. You can select an object only when the pointer is an arrow; you can drag a handle only when the pointer is a cross hair. If an object has no fill pattern or color and is therefore transparent, or if the object is a text box or button in which text is selected, you must point to the object's border to select the object. To select an invisible object, use the selection tool. To select an object that has a macro assigned to it, you must hold down COMMAND while you select the object.

Deleting a Graphic Object

You can delete a selected graphic object with the Edit Clear or Edit Cut command or by pressing DELETE. When you choose Edit Cut to delete a graphic object, Microsoft Excel places the graphic object on the Clipboard so you can paste it in the same document or another document. If you delete a graphic object with the Edit Clear command or by pressing DELETE, the graphic object is not placed on the Clipboard and cannot be pasted later.

Online Help also provides information on deleting a graphic object. To display online Help, choose the Window Help command. If you are using system software version 7.0 and the Help command does not appear on the Window menu, display Help by pointing to the Help menu icon and choosing the Microsoft Excel Help command. For information on a specific command, select the Commands topic. For information on using online Help, see "Using Help" in Chapter 1.

NOTE To delete an entire text box or button, you must select the box or button itself, not the text within the box or button. If you select text within the box or button, the selected text is deleted but the box or button remains. To select a text box or button when the text within it is already selected, click the border of the text box or button.

Deleting a graphic object

1. Select the graphic object or objects you want to delete.

   If a macro is assigned to an object, hold down COMMAND while clicking the object. This prevents the macro from running. You can also use the selection tool to select the object without running the macro.

2. To delete the objects and place them on the Clipboard so you can paste them elsewhere, choose Edit Cut.

   To delete the objects without placing them on the Clipboard, choose Edit Clear.

   You can also delete the objects without placing them on the Clipboard by pressing DELETE.

Undoing a deletion

- Choose Edit Undo immediately after deleting.

Combining Charts, Worksheets, and Macro Sheets

Combining charts and worksheets or macro sheets can be a good way to emphasize worksheet data for presentations or printed reports—worksheet data is sometimes easier to understand and analyze when it is shown along with a chart. One way to place a chart on a sheet is to create an embedded chart by using the chart tool in the tool bar or by copying a chart and pasting it on a sheet. An embedded chart is linked to its source data—when the source data changes, the chart changes. For information on creating an embedded chart, see "Creating a New Chart" in Chapter 11.

Another way to place a chart on a worksheet is to copy it as a *picture* using the Edit Copy Picture command. You can also copy pictures of cells and place them in a different part of the sheet or on another sheet.

Pictures of charts are not linked to their source data. Pictures of cells can be linked or unlinked:

- **Pictures of charts** Choose the Edit Copy Picture command to create an unlinked picture of a chart.
- **Pictures of cells** Choose the Edit Copy Picture command to create an unlinked picture of cells. To create a linked picture of cells, use the camera tool on the tool bar or the Edit Paste Picture Link command.

You can move or size a picture as you would any other graphic object on the sheet.

For information on	See
Creating an embedded chart or a chart as a separate document	Chapter 11, "Creating a Chart"
Editing a chart	Chapter 12, "Editing a Chart"
Formatting a chart	Chapter 13, "Formatting a Chart"
Selecting, moving, and sizing graphic objects	"Working with and Formatting Graphic Objects" earlier in this chapter
Creating and opening a macro sheet	"Creating and Opening a Macro Sheet" in Chapter 18
Copying graphics to or from another application	"Exchanging Graphics with Other Applications" later in this chapter

Online Help also provides information on combining charts, worksheets, and macro sheets. To display online Help, choose the Window Help command. If you are using system software version 7.0 and the Help command does not appear on the Window menu, display Help by pointing to the Help menu icon and choosing the Microsoft Excel Help command. For information on a specific command, select the Commands topic. For information on using online Help, see "Using Help" in Chapter 1.

Copying an unlinked picture of a chart

You can copy an unlinked picture of either an embedded chart or a separate chart document.

1. Select the chart.
2. Hold down SHIFT and choose Edit Copy Picture.

   Microsoft Excel displays a dialog box so you can choose whether to copy the chart as shown on the screen or as shown when printed.
3. To copy exactly what you see on the screen, select the As Shown On Screen option or options.

   To copy what you would see if you printed the chart, select the As Shown When Printed option or options.
4. Choose OK.
5. Activate the worksheet or macro sheet into which you want to paste the picture.
6. Select a cell or object where you want the picture pasted.
7. Choose Edit Paste.

Copying a chart as a linked embedded chart

You can also place a chart on a worksheet or macro sheet by copying either an existing embedded chart or by copying a separate chart document.

1. Double-click the embedded chart or activate the chart document.
2. Choose Edit Copy.
3. Activate the worksheet or macro sheet into which you want to paste the chart.
4. Select a cell or object where you want the chart pasted.
5. Choose Edit Paste.

Microsoft Excel creates a new embedded chart using the data series from the chart that you copied. The new embedded chart is linked to the same source data as the chart you copied. It is not linked to the copied chart itself.

Copying an unlinked picture of cells

You can paste an unlinked picture of worksheet or macro sheet cells into another worksheet or macro sheet to create tables that you can move and size as you want.

NOTE When you copy an unlinked picture of cells, Microsoft Excel also copies the row and column headings and gridlines if they are currently displayed on your screen. To avoid copying the headings, choose the Options Display command and turn off the Row & Column Headings check box and the Gridlines check box before you do this procedure.

1 Select the cells you want to copy.

2 Hold down SHIFT and choose Edit Copy Picture.

Microsoft Excel displays a dialog box so you can choose whether to copy the selection as shown on the screen or as shown when printed.

3 To copy exactly what you see on the screen, along with row and column headings and gridlines if they are currently displayed, select the As Shown On Screen option.

To copy what you would see if you printed the selection, select the As Shown When Printed option.

4 Activate the worksheet or macro sheet onto which you want to paste the picture.

5 Select a cell or object where you want the picture pasted.

6 Choose Edit Paste.

Copying a linked picture of cells

You can link a picture of cells so the picture updates automatically whenever you update the source sheet. Microsoft Excel updates both data and formats, including gridlines, whenever the source sheet is changed. To copy a linked picture of cells, you use the camera tool ( ) on the tool bar or the Edit Copy and Edit Paste Picture Link commands.

1 On the worksheet or macro sheet, select the cells you want to copy.

2 Click the camera tool on the tool bar.

3 Activate the worksheet or macro sheet onto which you want to paste the picture.

4 Click the cell or object where you want to paste the picture.

Microsoft Excel pastes the picture when you click the cell or object.

1 On the worksheet or macro sheet, select the cells you want to copy.

2 Choose Edit Copy.

3 Activate the worksheet or macro sheet onto which you want to paste the picture.

4 Select the cell or object where you want to paste the picture.

5 Hold down SHIFT and choose Edit Paste Picture Link.

MORE ABOUT

More About Combining Charts, Worksheets, and Macro Sheets

Guidelines

Updating a Linked Cell Picture To update a linked cell picture, you must update the source document. To activate the source document, double-click the linked picture. If the source document is not open, Microsoft Excel automatically opens it and selects the source cell range in the source document.

Changing a Link When you select a linked cell picture, Microsoft Excel displays the link formula in the formula bar—for example, =Worksheet1!$A$1:$B$12. You can edit the link formula in the formula bar to link the picture to a different source document. If you link the picture to a different source document, the picture is not updated unless the new source document is open. To quickly open the source document, double-click the picture. For more information on the link formula, see "Linking Documents" in Chapter 8.

Tip

Use Unlinked Pictures If You Can Worksheets that contain unlinked chart or cell pictures open and recalculate faster than similar worksheets containing linked or embedded charts or cell pictures. If you don't need your data to be updated automatically, use unlinked pictures of cells or charts rather than linked cell pictures or embedded charts.

Exchanging Graphics with Other Applications

In addition to combining pictures of Microsoft Excel documents within Microsoft Excel, you can also copy pictures from other applications into Microsoft Excel, or copy pictures of Microsoft Excel documents and paste them into other applications. You can also exchange data between other applications and Microsoft Excel. This section describes only exchanging graphical representations or pictures.

For information on	See
Exchanging data between Microsoft Excel and another application	Chapter 8, "Working with Data from Multiple Documents"

Online Help also provides information on exchanging graphics with other applications. To display online Help, choose the Window Help command. If you are using system software version 7.0 and the Help command does not appear on the Window menu, display Help by pointing to the Help menu icon and choosing the Microsoft Excel Help command. For information on a specific command, select the Commands topic. For information on using online Help, see "Using Help" in Chapter 1.

Importing Graphics from Another Application

You can import pictures from any applications that support the PICT format on the Clipboard. If the source application supports dynamic data exchange (DDE) or the Apple Edition Manager, you may be able to link the picture to the source document, so the copy is updated whenever the source document is updated. The Apple Edition Manager and DDE are available only if you're using system software version 7.0. For more information, see "Creating Publishers and Subscribers" in Chapter 8 and also consult your Macintosh documentation.

When you paste an imported picture in a worksheet or macro sheet, you can control where the picture is pasted by selecting a cell or object.

Copying graphics to Microsoft Excel

1 Start or activate the application from which you want to copy, and open or activate the document that contains the picture you want to copy.

2 Follow the application's procedures for copying. Many applications have an Edit Copy command to do this.

3 Activate the Microsoft Excel worksheet or macro sheet into which you want to paste the copied picture.

4 Select a cell or object where you want the picture pasted.

5 To paste an unlinked picture, choose Edit Paste.

If you are using system software version 7.0 and if the application you are copying from supports DDE, you can paste a linked copy of the picture. To paste a linked copy using DDE, choose Edit Paste Link.

Exporting Microsoft Excel Documents as Pictures

You can copy a picture of a Microsoft Excel chart or a portion of a worksheet and paste that picture into another application, such as a word processor.

You can export pictures to any applications that support the PICT format on the Clipboard. If the application you export to supports the Apple Edition Manager or DDE, you can also link the picture to the Microsoft Excel document, so the copy is updated whenever the Microsoft Excel document is updated. The Apple Edition Manager and DDE are available only if you're using system software version 7.0. For more information, see "Creating Publishers and Subscribers" in Chapter 8 and also consult your Macintosh documentation.

Copying a picture of cells to another application

1 In Microsoft Excel, select the cells you want to copy.

2 Hold down SHIFT and choose Edit Copy Picture.

Microsoft Excel displays a dialog box so you can specify whether to copy the selection as shown on the screen or as shown when printed.

3 To copy exactly what you see on the screen, along with row and column headings and gridlines if they are currently displayed, select the As Shown On Screen option.

To copy what you would see if you printed the selection, select the As Shown When Printed option.

4 Choose OK.

5 Start or activate the application into which you want to paste the copy, and open or activate the document into which you want to paste.

6 Paste the copy from the Clipboard using the procedure for pasting data in the application you are copying to.

Copying a picture of a chart to another application

1 In Microsoft Excel, activate the chart document or select the embedded chart you want to copy.

2 Hold down SHIFT and choose Edit Copy Picture.

Microsoft Excel displays a dialog box so you can choose whether to copy the chart as shown on the screen or as shown when printed.

3 To copy exactly what you see on the screen, select the As Shown On Screen option or options.

To copy what you would see if you printed the chart, select the As Shown When Printed option or options.

4 Choose OK.

5 Start or activate the application into which you want to paste the chart, and open or activate the document in which you want to paste.

6 Paste the copy from the Clipboard using the procedure for pasting data in the application you are copying to.

MORE ABOUT

More About Exchanging Graphics with Other Applications

Guidelines

Opening a Microsoft Excel Document with Linked Pictures When you open a Microsoft Excel document that contains pictures linked to another application, Microsoft Excel asks you if you want to reestablish the links to the other application. Choose Yes to reestablish the links so the picture will be updated. Choose No to freeze the links and use the picture as it was last updated; Microsoft Excel will ask you if you want to reestablish links the next time you open the document. If the other application is not running, Microsoft Excel asks you if you want to start the supporting application. If you don't start the supporting application, Microsoft Excel does not reestablish links to the application.

Displaying and Changing a Link When you select a picture in Microsoft Excel that is linked to another application, Microsoft Excel displays the link formula in the formula bar. The link formula identifies the application and document containing the source picture. You can edit the link formula in the formula bar to link the picture to a different source document. For more information on the link formula, see "Linking Documents" in Chapter 8. The linked picture is updated only if the document providing the source data is also open.

Pasting Only the Picture Portion of the Clipboard If the Clipboard contains both pictures and data, and if a cell is selected when you choose Edit Paste in Microsoft Excel, Microsoft Excel automatically pastes the data. If a graphic object is selected when you choose Edit Paste, Microsoft Excel pastes the picture. If the Clipboard contains only data, and if an object is selected when you choose Edit Paste, Microsoft Excel creates a text box and pastes the data from the Clipboard to the text box.

Printing

Without quitting Microsoft Excel, you can set up printers and specify printing options, such as landscape or portrait printing. You can define the printed page to look the way you want, by including or omitting column headings and gridlines, adding and formatting headers and footers, and centering the page horizontally and vertically. Before you print, you can preview your pages and change your margins in the preview window.

NOTE Unless otherwise noted, all information and procedures for working with worksheets also apply to macro sheets.

Table of Contents

Setting Up Your Printer ... 525
Setting Up Your Pages ... 527
Previewing Your Pages ... 533
Printing ... 539

Setting Up Your Printer

To set up a printer for Microsoft Excel, you must have first installed the printer. Once you have installed the printer you want to use, you use the Chooser desk accessory on the Apple menu to select the printer. For more information on installing printers, see your Macintosh documentation.

For information on	See
Setting up the printed page	"Setting Up Your Pages" later in this chapter
Printing	"Printing" later in this chapter
Printing the Info window	"Viewing Detailed Information About Cells" in Chapter 6

Online Help also provides information on setting up your printer. To display online Help, choose the Window Help command. If you are using system software version 7.0 and the Help command does not appear on the Window menu, display Help by pointing to the Help menu icon and choosing the Microsoft Excel Help command. For information on a specific command, select the Commands topic. For information on using online Help, see "Using Help" in Chapter 1.

Installing and Selecting a Printer

You use the Chooser desk accessory on the Apple menu to select a printer from the list of printers you've installed.

Before you can select a printer, you must install the printer driver for the printer you want to use. The following procedure describes how to install a printer driver. For more information, see your printer documentation.

Installing a printer

1. Copy the printer driver for the printer you want to install to the System Folder.
2. If you will be printing on an Apple LaserWriter, use the Installer program provided with your LaserWriter to install the LaserWriter driver. For information on using the Installer, see your LaserWriter documentation.
3. For best printing results, install the fonts designed for your printer using the Font/DA Mover provided with your Macintosh system. The fonts for your printer are provided with the printer. For information on the Font/DA Mover, see your Macintosh documentation.

   If you are using system software version 7.0, you do not need the Font/DA Mover to install your fonts. Instead, you just drag the fonts into the System Folder.

Selecting a printer

1. Choose the Chooser desk accessory from the Apple menu.
2. Select the icon for the printer you want to use.
3. If you selected an AppleTalk printer and your AppleTalk network is connected to other AppleTalk networks, you'll see a list of the AppleTalk zones that are available on your network. Select the zone containing the printer you want to use.
4. If you selected an ImageWriter, in the Select A Printer Port box, select the icon for the Macintosh port that is connected to your ImageWriter.

   If you selected an AppleTalk printer, select the name of the printer you want to use.
5. Click the close box to close the Chooser dialog box and save your printer selection.

Setting Up Your Pages

You can control the appearance of your printed worksheet, chart, or macro sheet by selecting the page layout options you want. For documents of more than one page, you can set manual page breaks and specify column and row titles to appear on each page.

For Information on	See
Setting up your printer	"Setting Up Your Printer" earlier in this chapter
Formatting a worksheet	Chapter 5, "Formatting a Worksheet"

Online Help also provides information on setting up your pages. To display online Help, choose the Window Help command. If you are using system software version 7.0 and the Help command does not appear on the Window menu, display Help by pointing to the Help menu icon and choosing the Microsoft Excel Help command. For information on a specific command, select the Commands topic. For information on using online Help, see "Using Help" in Chapter 1.

Setting Up the Page Layout for Printing

The File Page Setup command controls the appearance of the printed document. When you save a document, Microsoft Excel saves the page setup settings with the document.

With the File Page Setup command, you can define a header and footer to appear on every page, change page margins, and specify whether to print gridlines and row and column headings.

The following settings in the File Page Setup dialog box may vary, depending on which type of window is active. If you are printing a chart, there are no options for printing gridlines and row and column headings, and there's an extra option for setting the size of your printed chart. The Header, Footer, and Margins options work the same way for printing charts as they do for printing worksheets.

When you print the information displayed in the Info window, File Page Setup determines the appearance of the pages. The File Page Setup options for the Info window are the same as for worksheets.

- **Header/Footer** Specifies the content of the header or footer and its position on the page. For all new documents, the default header is the document name and the default footer is the word "Page" and the page number. Regardless of how your margins are set, headers are always printed 1/2 inch from the top and 3/4 inch from the side of the page. Footers are always printed 1/2 inch from the bottom and 3/4 inch from the side of the page. For information on specifying headers and footers, see "More About Setting Up Your Pages," later in this section.

- **Margins** Specifies the amount of space between the edge of the paper and the printed area on the top, bottom, left, and right sides of the page. Margin settings do not affect the placement of headers and footers. Make sure you set your margins large enough to allow space for the headers and footers.
- **Center** Centers the document horizontally or vertically on the page.
- **Print Row and Column Headings** (Worksheets and macro sheets only) Controls whether the row and column headings are printed.
- **Print Gridlines** (Worksheets and macro sheets only) Controls whether the gridlines are printed.

NOTE Turning off gridlines for printing does not affect whether or not they are displayed on the screen. To turn off screen display of gridlines, use the Options Display command. If you turn off the gridlines on your screen display with the Options Display command, Microsoft Excel turns off the Gridlines check box in the File Page Setup dialog box so the gridlines will not be printed.

- **Size** (Charts only) Specifies how you want the chart printed on the page. You can print the chart screen size (print the chart the same size as on the screen), fit to page (print the chart as large as possible while retaining its height-to-width ratio), or full page (print the chart to fit the entire page, regardless of its height-to-width ratio on the screen).

You can also specify other page setup options, such as vertical or horizontal orientation, which depend on the type of printer you have installed. These options are saved with the current document. For example, if you want to print several charts horizontally and then print a worksheet vertically, you can save the orientation you want with each document by selecting the option with the Page Setup command.

Setting up the page layout

1 Choose File Page Setup.

A dialog box is displayed with various options, depending on the type of window that is active (worksheet, chart, or Info window).

2 Select the page setup options you want.

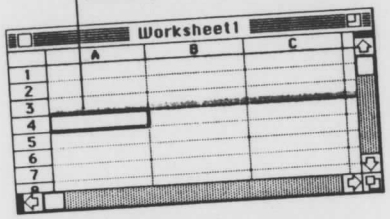
3 Choose OK.

Setting Manual Page Breaks

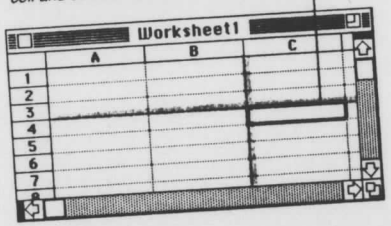
If a document is longer than one page, Microsoft Excel divides it into pages based on the margin settings in the File Page Setup dialog box. For worksheets and macro sheets, Microsoft Excel first paginates vertically to the last row of data, and then horizontally to the last column of data.

You can set manual page breaks with the Options Set Page Break command. The following illustrations show how to indicate where you want manual page breaks.

To insert this page break, select this cell and choose Options Set Page Break.



To insert these page breaks, select this cell and choose Options Set Page Break.



When you set a manual page break, Microsoft Excel adjusts the automatic page breaks in the rest of the worksheet. If you want to check your page breaks, use the Print Preview command. You can distinguish manual page breaks from automatic page breaks because manual page breaks are darker. Page breaks are saved with the document.

You can control whether automatic page breaks appear on the screen with the Options Display command. Manual page breaks always appear.

Setting a manual page break

To do this procedure, you must be using full menus.

1 Select the cell below or to the right of the gridline where you want the page break.

2 Choose Options Set Page Break.

Removing a manual page break

When you select a cell below or to the right of a manual page break, the Options Set Page Break command changes to Options Remove Page Break.

To do this procedure, you must be using full menus.

1 Select any cell directly below or to the right of the manual page break.

2 Choose Options Remove Page Break.

Removing all manual page breaks

To do this procedure, you must be using full menus.

1 Select the entire worksheet.

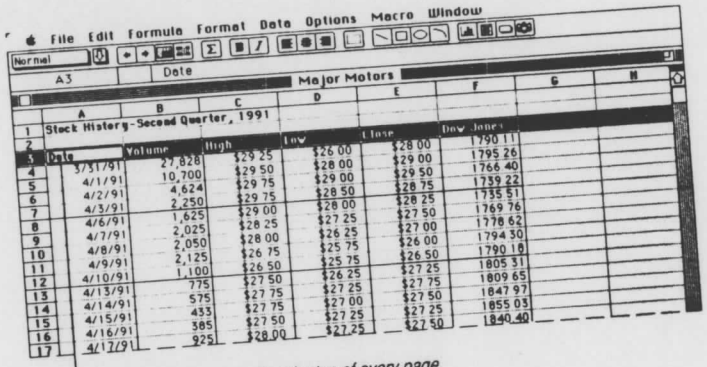
2 Choose Options Remove Page Break.

Specifying Row or Column Titles

You can specify *print titles*, which are row or column titles you want printed on each page of your worksheet. This feature is especially useful for large documents in which you need to keep track of long rows or columns of data. The rows or columns you use for print titles can be anywhere on the worksheet. If you select a row for the print titles, they are printed at the top of the page; if you select a column for the print titles, they are printed at the left side of the page.

NOTE You must select an entire row or column for print titles. You can designate multiple rows and columns, but they must be adjacent; for example, you can select rows 1 and 2 or columns D and E, but not rows 1 and 4 or columns A and C.

The following illustration shows print titles in a row:



To print the titles in row 3 at the top of every page, select the row and choose Options Set Print Titles.

Setting row or column print titles

To do this procedure, you must be using full menus.

1 Select the rows or columns that contain the titles you want. You must select the entire row or column.

To specify both rows and columns, make a multiple selection, with one area for the column titles and one area for the row titles.

2 Choose Options Set Print Titles.

Microsoft Excel names the area you select Print_Titles. You can use this name to refer to this area as you would any other named range. Whenever you print the worksheet, Microsoft Excel prints it with the titles you specified.

Canceling print titles

1 Select the entire worksheet.

2 Choose Options Remove Print Titles.

More About Setting Up Your Pages

MORE ABOUT

Guideline

Specifying a Header and Footer To specify a header and footer, type the text and codes you want to use as your header and footer in the File Page Setup dialog box.

MORE ABOUT

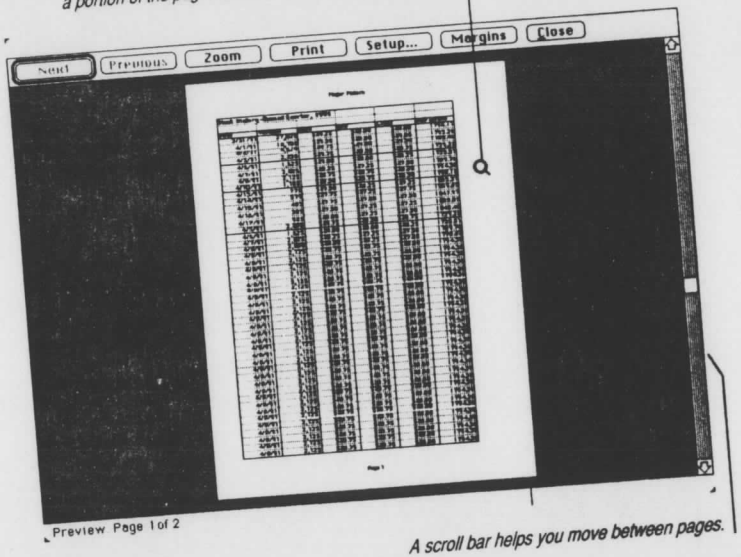
By using the following codes in the Header and Footer boxes, you can align portions of the header or footer to the left, right, or center; include the page number, date, time, or document name; and print the header or footer in bold or italic.

Type	To
&L	Left-align the characters that follow.
&C	Center the characters that follow.
&R	Right-align the characters that follow.
&B	Print the characters that follow in bold.
&I	Print the characters that follow in italic.
&U	Print the characters that follow with an underline.
&S	Print the characters that follow with a strikethrough.
&O	Print the characters that follow in outline style.
&H	Print the characters that follow in shadow style.
&D	Print the current date.
&T	Print the current time.
&F	Print the name of the document.
&P	Print the page number.
&P+*number*	Print the page number plus *number*. (For example, **&P+3** makes the page numbering start at 4.)
&P–*number*	Print the page number minus *number*.
&&	Print a single ampersand.
&*"fontname"*	Print the characters that follow "fontname" in the font you specify. Be sure to enclose the font name in double quotation marks.
&*nn*	Print the characters that follow in the font size you specify. Use a two-digit number to specify the font size in points.
&N	Print the total number of pages in the document. For example, in a 12-page document, enter **Page &P of &N** to have Page 1 of 12, Page 2 of 12, Page 3 of 12, and so on, printed on the pages.

You can include any of these codes in a single header or footer. For example, you would type **&L&"Helvetica"&10Budget&C&P&R&D** to print "Budget" left-aligned in 10-point Helvetica, the page number centered, and the current date right-aligned.

Previewing Your Pages

By previewing your document, you can see each page exactly as it will be printed, with the correct margins and page breaks, and the headers and footers in place. When you preview your document, the document appears in the preview window as shown in the following illustration.


The mouse pointer becomes a magnifying glass. To magnify a portion of the page, click the area you want enlarged.
Next
Previous
Zoom
Print
Setup...
Margins
Close
Preview: Page 1 of 2
A scroll bar helps you move between pages.

The current page number is shown in the status bar. The buttons at the top of the window control viewing the next or previous page, enlarging the page, printing the document, opening the File Page Setup dialog box, displaying the margin and column handles, and closing the preview window.

For information on	See
Changing page settings	"Setting Up Your Pages" earlier in this chapter

Online Help also provides information on previewing your pages. To display online Help, choose the Window Help command. If you are using system software version 7.0 and the Help command does not appear on the Window menu, display Help by pointing to the Help menu icon and choosing the

Microsoft Excel Help command. For information on a specific command, select the Commands topic. For information on using online Help, see "Using Help" in Chapter 1.

Previewing a Document

You can preview your worksheet, chart, or macro sheet to see how it will look when you print it. For example, you can see your headers, footers, and margins as they will look on the page. By previewing before printing, you can save time and trips to the printer.

You can use the buttons at the top of the preview window as described in the following table.

To	Choose this button
View the next page	Next
View the previous page	Previous
Magnify the page	Zoom
Print the page directly from print preview	Print
Display the File Page Setup dialog box	Setup
Display the current margin settings and column widths	Margins
Return to the document window	Close

Previewing a document

▶ Choose File Print Preview.

Microsoft Excel displays your document as it will look when it is printed. Your document is initially reduced so the entire page fits on the screen.

NOTE You can also preview your document by turning on the Print Preview check box in the File Print dialog box before you print your document. This allows you to preview specific pages rather than the entire document. For more information on the File Print dialog box, see the following section, "Printing."

Previewing a Document in Actual Size

There are two ways to preview your document:

- **Full-page view** Reduced view with one full page in the preview window.
- **Actual-size view** Enlarged view with only a portion of the page in the preview window.

When you first preview your document, you see full-page view: an entire page on the screen. If you want a closer look at the page, you can enlarge the page to actual size. You can switch between these two views of your document by using the Zoom button.

The following procedures describe how to enlarge a specific area of the document from full-page view to actual-size view, how to return to full-page view from actual-size view, and how to quickly switch between the two views.

Switching from full-page view to actual-size view

▶ Click the Zoom button.

Or, click the area of the document you want to see in actual size. When the mouse pointer is over the page it is shaped like a magnifying glass.

▶ Press Z.

Microsoft Excel switches the document from full-page view to actual-size view.

Returning to full-page view

When you want to switch from actual-size view to full-page view:

▶ Click the Zoom button.

▶ Press Z.

Microsoft Excel switches the document from actual-size view back to full-page view.

Scrolling Through a Document

Use the following procedures when you want to move to the next page, the previous page, or a specific page in a document when you are in full-page view, or when you want to see another section of the current page when you are in actual-size view.

Previewing the next or previous page in full-page view

When you have a multiple-page document displayed in full-page view, vertical scroll bars appear in the preview window. To go to the next or previous page in the document when you are in full-page view:

▶ Click the Next or Previous button to go to the next or previous page.

You can also click the up or down scroll arrow on the vertical scroll bar.

▶ Press N or P to move to the next or previous page.

You can also press ENTER to go to the next page.

NOTE The Next button is unavailable when the last page is displayed, and the Previous button is unavailable when the first page is displayed.

Scrolling to a specific page in full-page view

Use the following procedure when you are in full-page view and want to go to a particular page in the document.

▶ Drag the scroll box in the vertical scroll bar until you reach the number you want.

The page numbers change in the status bar at the bottom of the screen.

Scrolling in a document in actual-size view with the mouse

When your document is in actual-size view, horizontal and vertical scroll bars appear in the preview window. Use the following procedures to view the rest of the page with the mouse.

To	Do this
Move to the left of the page	Click the left scroll arrow in the horizontal scroll bar.
Move to the right of the page	Click the right scroll arrow in the horizontal scroll bar.
Move to the top of the page	Click the up scroll arrow in the vertical scroll bar.
Move to the bottom of the page	Click the down scroll arrow in the vertical scroll bar.
Move to a specific part of the page	Drag the scroll box in either scroll bar to the approximate position.
Move to the next page	Click the Next button.
Move to the previous page	Click the Previous button.

Scrolling in a document in actual-size view with the keyboard

Use the following procedures when your document is in actual-size view to view the rest of the page with the keyboard.

To	Press
Move left, right, up, or down	ARROW keys
Move to the left of the page	COMMAND+LEFT ARROW or HOME
Move to the right of the page	COMMAND+RIGHT ARROW or END
Move to the top of the page	COMMAND+UP ARROW
Move to the bottom of the page	COMMAND+DOWN ARROW
Move to the upper-left corner of the page	COMMAND+HOME
Move to the lower-right corner of the page	COMMAND+END
Move to the next page	N
Move to the previous page	P

Changing the Margins

You can display your margin settings with the Margins button at the top of the window. The margins are shown by dotted lines across the page with handles at either end. You can change the margin positions by dragging the margin handles. For more information on margins, see "Setting Up Your Pages," earlier in this chapter.

Displaying the margins

You can display the margins whenever you want to check or change your margin settings.

▶ Choose the Margins button.

The margins are indicated by dotted lines across the page.

Adjusting the margins

You can change the margins whenever you want to increase or decrease the amount of white space between the worksheet or chart and the edge of the paper.

▶ Drag the margin handle at either end of the dotted line.

The status bar displays the size of the margin as you drag.

Removing the margin lines

You can remove the dotted lines representing the margins whenever you don't want to see them on the screen.

▶ Choose the Margins button.

Changing the Column Widths

When you preview a worksheet or macro sheet, you can display handles that show the column widths. You display the column handles by using the Margins button at the top of the window. You can change the width of a column by dragging the column handle. For more information on column widths, see "Changing Column Widths and Row Heights" in Chapter 5.

Displaying the column handles

You can display the column handles whenever you want to check or change the column widths. The Margins button displays the column handles as well as the margin handles.

▶ Choose the Margins button.

Column handles appear across the top of the page over the right edge of each column. When the mouse pointer is over a column handle, it changes shape to indicate that you can change the column widths. The status bar displays the column width.

Adjusting column width

With the column handles displayed, you can increase or decrease the column width while previewing a document in full-page view or in actual-size view.

▶ Drag the column handle to the left or right to change the column width.

You cannot drag a column handle farther left than the left column boundary and you cannot drag a column handle farther right than the right margin.

If a change in the column width causes Microsoft Excel to repaginate the document, Microsoft Excel redisplays the same page you were viewing before the repagination.

Removing the column handles

You can remove the handles representing the columns whenever you don't want to see them on the screen.

▶ Choose the Margins button.

Setting Up the Printed Page

While you are previewing a document, you may realize that you want to change one or more of the options you selected with the File Page Setup command. With the Setup button at the top of the window, you can open the File Page Setup dialog box and change headers, footers, orientation, and other page setup options without closing the preview window. For more information, see the preceding section, "Setting Up Your Pages."

Displaying the Page Setup dialog box

1 Choose the Setup button.

The File Page Setup dialog box appears. The preview window remains on the screen.

2 Change any setup options you want.

3 Choose OK.

Printing the Document or Closing the Preview Window

When you have finished previewing your document, you can print your document or close the preview window.

Printing the document

If you displayed the preview window by turning on the Print Preview check box in the File Print dialog box, just choose the Print button. Your document will be printed immediately since the File Print dialog box has already been displayed.

If you displayed the preview window by using the File Print Preview command, use the following procedure to print your document.

1 Choose the Print button.

The File Print dialog box appears.

2 Select the options you want.

3 Choose the Print button.

Microsoft Excel sends your document to the selected printer. For more information on selecting an installed printer, see "Setting Up Your Printer," earlier in this chapter. For more information on printing a document, see the following section, "Printing."

Closing the preview window

▶ Choose the Close button.

The document window is redisplayed.

Printing

This section describes how to print an entire document, a portion of a worksheet, multiple selections of a worksheet, a range of pages, a chart, and the Info window. After you select what you want to print, you choose the File Print command to print it.

For information on	See
Changing page settings	"Setting Up Your Pages" earlier in this chapter
Changing the installed printer	"Setting Up Your Printer" earlier in this chapter

Online Help also provides information on printing. To display online Help, choose the Window Help command. If you are using system software version 7.0 and the Help command does not appear on the Window menu, display Help by pointing to the Help menu icon and choosing the Microsoft Excel Help command. For information on a specific command, select the Commands topic. For information on using online Help, see "Using Help" in Chapter 1.

Printing a Document

Use the File Print command to print a document. If you are printing a worksheet or macro sheet, you can specify that Microsoft Excel print only the sheet, only the cell notes, or both. In addition, you can use the File Print command to specify page ranges and to preview the document.

Printing a document

1 Choose File Print.

2 If you want to print more than one copy, type the number of copies you want to print.

3 If you want to print a range of pages, type the number of the first page you want in the From box and the last page you want in the To box.

4 To preview the pages and page breaks on the screen before printing, turn on the Print Preview check box. When you choose OK, the first page of the document is displayed in the preview window. You can also preview your document with the File Print Preview command. For more information on the preview window, see the preceding section, "Previewing Your Pages."

5 If you are printing a worksheet or macro sheet, select the Sheet option to print only the sheet, the Notes option to print only the notes from the sheet, or the Both option to print both.

6 Choose OK.

Microsoft Excel displays a message indicating it is printing your document. If you want to cancel printing, press COMMAND+PERIOD.

Printing Sections of a Worksheet

If you want to print a range of a worksheet or macro sheet that is not made up of whole pages, define the range as the *print area*. Only the print area is printed when you choose the File Print command. If you specify printing of notes, only the notes from the print area are printed.

If you make a multiple selection before defining the print area, the individual selections are printed on separate pages, one after the other, in the order they were selected.

When you define a print area with the Options Set Print Area command, Microsoft Excel names the range or ranges you select Print_Area. You can use this name to refer to this area as you would any other named range. Whenever you print the worksheet, Microsoft Excel prints the area you specified until you redefine the print area or delete the name Print_Area. For more information on named ranges, see "Naming Cells and Formulas" in Chapter 6.

Printing a section of a worksheet

1 Select the range or ranges you want to print.

2 Choose Options Set Print Area.

3 Choose File Print.

4 If you want to print more than one copy, type the number of copies you want to print.

5 If you want to print a range of pages in the print area, type the number of the first page you want in the From box and the last page you want in the To box.

6 To preview the pages and page breaks on the screen before printing, turn on the Print Preview check box. When you choose OK, the first page of the document is displayed in the preview window. You can also preview your document with the File Print Preview command. For more information on the preview window, see the preceding section, "Previewing Your Pages."

7 If you are printing a worksheet or macro sheet, select the Sheet option to print only the sheet, the Notes option to print only the notes from the sheet, or the Both option to print both.

8 Choose OK.

Microsoft Excel displays a message indicating it is printing your document. If you want to cancel printing, press COMMAND+PERIOD.

Removing the print area

If you want to print the entire worksheet after you have defined a print area, you must remove the print area with the Options Remove Print Area command.

1 Select the entire worksheet.

2 Choose Options Remove Print Area.

More About Printing

MORE ABOUT

Guidelines

Printing the Info Window When the Info window is active, File Print prints the information displayed in the Info window for the selected cells on the worksheet. To print all of the information about the worksheet, select the entire worksheet before you activate the Info window for printing.

You can specify what is displayed in the Info window with the Info menu commands, which are available when the Info window is active. For more information on the Info window, see "Auditing a Worksheet," in Chapter 6.

MORE ABOUT

All of the File Print dialog box options are available and work the same for the Info window as for a worksheet. For a description of these options, see "Printing a Document," earlier in this section.

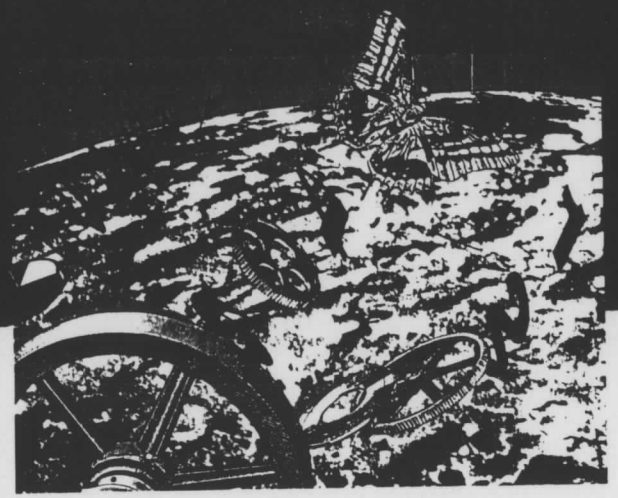
Printing a Chart When a chart is the active document, the File Print command prints the chart. The size of the chart is determined by the File Page Setup dialog box settings. For more information, see "Setting Up Your Pages," earlier in this chapter.

The File Print dialog box for charts has fewer options than the dialog box for worksheets, but the available options in the dialog box for charts work the same way as the options for worksheets. For more information on these options, see "Printing a Document," earlier in this section.

Printing More than One Worksheet or Macro Sheet You can print several Microsoft Excel worksheets and macro sheets at the same time by first defining them as a workgroup. To do this, open all the worksheets and macro sheets you want to print and choose the Window Workgroup command. To identify the sheets that are part of the workgroup, Microsoft Excel adds "[Workgroup]" to the sheet name in the title bar. When you choose the File Print command, all the sheets in the workgroup are printed, one after another. You cannot include a chart in a workgroup. For information on defining and editing a workgroup, see "Editing Worksheets as a Group," in Chapter 8.

Troubleshooting

Printing a 3-D Chart on a Plotter Microsoft Excel may not be able to print your three-dimensional chart on an electronic plotter. If you have this problem, change the chart to a two-dimensional chart type or use a regular printer.



Customizing and Automating

Part 6 Table of Contents

Chapter 16 Customizing the Workspace and Protecting Data ... 545
Tailoring Microsoft Excel to your work by using workspaces, startup documents, templates, and color palettes. Protecting whole documents or selected parts from inadvertent changes.

Chapter 17 Creating and Using Custom Worksheet Functions ... 563
Writing worksheet functions to fit your special needs.

Chapter 18 Automating Tasks with Command Macros ... 575
Recording and playing back command macros (sequences of actions and commands) to increase your speed and accuracy when doing repetitive or complex tasks. Creating buttons you can use to run command macros.

Chapter 19 Designing and Writing a Command Macro ... 591
Writing command macros using the Microsoft Excel macro functions. Making command macros respond differently under varying conditions.

Chapter 20 Creating a Custom Application ... 615
Creating your own application including menus, commands, and dialog boxes. Creating custom Help topics. Creating add-in macros. Creating macro sheets for users in other countries. Using code resources as functions in your worksheets and macro sheets.

Customizing the Workspace and Protecting Data

With Microsoft Excel you can set up your computer working environment to match the specific jobs you perform. Once you have things set up, you can store your settings for future use. With Microsoft Excel, you can protect your settings from unwanted changes. You can protect cells, objects, documents, and the position of windows on your screen.

This chapter does not discuss customizing menus and commands. For that information, see Chapter 20, "Creating a Custom Application."

NOTE Unless otherwise noted, all information and procedures for working with worksheets also apply to macro sheets.

Table of Contents

Setting Up a Workspace ... 545
Specifying a Startup Folder and Document ... 549
Creating and Using a Document Template ... 551
Creating a Custom Color Palette ... 554
Protecting Documents and Windows ... 556

Setting Up a Workspace

The workspace is the main work area used by Microsoft Excel to display the documents you have open. You can set up the workspace to best suit the tasks at hand and the way you work. When you set up your workspace, you can:

- Hide windows in the workspace.
- Turn on or off parts of the application, such as the scroll bars and status bar.
- Set options that apply to all of the documents open in the workspace, such as the type of cell references used.

When you have the workspace set up as you want it, you can save the workspace as a workspace file. When you save a workspace file, Microsoft Excel saves the settings for the workspace and also saves a list of the names of documents currently open.

Once you save the list of documents as a workspace file, you can reopen all of them at once just by opening the workspace file. This makes it easy for you to pick up a task where you left off. A workspace file is also useful if you work with a particular set of documents for certain tasks. You can create a workspace file for each task you do and save each workspace under a different name. You open a workspace file the same way you open a regular document.

Workspace files also can be useful in command macros and as startup documents—documents that are opened every time you start Microsoft Excel.

For information on	See
Startup documents	"Specifying a Startup Folder and Document" later in this chapter
Command macros that run automatically	"Running a Command Macro" in Chapter 18
Custom applications	Chapter 20, "Creating a Custom Application"

Hiding a window

Hiding a window reduces the number of windows on your screen and helps prevent unwanted changes to the document in the window. Hiding a window doesn't break any links to other documents or make macros in the hidden window unavailable.

To do this procedure, you must be using full menus.

1 Activate the window you want to hide.

2 Choose Window Hide.

Making a hidden window visible

Make a hidden window visible when you need to make changes to it or when you need to see its formulas or documentation.

To do this procedure, you must be using full menus.

1 Choose Window Unhide.

If the hidden window contains the only open document in the workspace, choose File Unhide.

2 In the Unhide box, select the name of the window you want to make visible.

3 Choose OK.

Displaying or hiding parts of the workspace

With the Options Workspace command, you can specify which parts of the workspace you want to use. This lets you customize Microsoft Excel for the various tasks you do. For example, suppose you create a workspace that includes a macro sheet of printing macros for advanced printing tasks. You can turn the formula bar off, so that documents cannot be changed when you are using that workspace. You can also turn on or turn off the status bar, tool bar, and scroll bars. You can specify a key to activate the menu bar and specify whether you want underlines to appear on menus to indicate the access keys you can press to select a menu or choose a command.

To do this procedure, you must be using full menus.

1 Choose Options Workspace.

2 To display or hide scroll bars in the workspace, turn the Scroll Bars check box on or off.

To display or hide the status bar, turn the Status Bar check box on or off.

To display or hide the formula bar, turn the Formula Bar check box on or off.

To display or hide the tool bar, turn the Tool Bar check box on or off.

To specify a key to activate the menu bar, type the key in the Alternate Menu Key box.

To turn command underlines on or off, select On or Off. You can also select the Automatic option to have the underlines appear only when you activate the menu bar with the keyboard.

3 Choose OK.

Changing other workspace settings

You can change the type of references displayed, have Microsoft Excel move the selection after you press ENTER, and specify a fixed number of decimal places so you don't have to type a decimal point when entering decimals. If you are using system software version 7.0, you can also turn on or off requests for data from other applications linked to Microsoft Excel.

To do this procedure, you must be using full menus.

1 Choose Options Workspace.

2 Select the options you want.

If you want a description of the dialog box options, you can press COMMAND+SLASH (/) while the dialog box is displayed on your screen

Saving a workspace

To do this procedure, you must be using full menus.

1 Choose File Save Workspace.

2 In the Save Workspace As box, type a name for the workspace file.

3 Choose OK.

If you have unsaved documents, Microsoft Excel displays a series of messages asking if you want to save your changes. To save the changes, choose Yes. To ignore the changes, choose No. To cancel the File Save Workspace command, choose Cancel.

IMPORTANT A workspace file is really a list of documents—not the documents themselves. Make sure you save changes to all documents listed in a workspace before you close the workspace. If you have not saved the documents on your disk, you will not be able to reopen them, even though they were open when you saved the workspace file.

MORE ABOUT

More About Setting Up a Workspace

Guidelines

Settings Saved with the Workspace In addition to a list of all documents that are open, a workspace file stores the following information:

- Position and size of all windows used for the open documents
- Options selected in the Options Workspace dialog box
- Options selected in the Options Display dialog box for each worksheet or macro sheet
- Preferred chart type
- Global calculation settings (Automatic/Manual and Iteration)
- Menu style (full or short menus)
- Info window settings

Using Individual Documents You can open separately any document you've saved in a workspace file. Any changes you make to the document or to its document window size and position are reflected the next time you open the document as part of the workspace file.

Earlier Versions Cannot Open Microsoft Excel 3.0 Workspace Files Earlier versions of Microsoft Excel cannot open workspace files created by Microsoft Excel version 3.

Tips

Matching Workspace Files to Tasks You might find it useful to set up several workspace files to accommodate each arrangement of windows and documents you use. When you want to work with a particular set of documents and windows, you open the appropriate workspace file. For example, you might set up one workspace file for calculating sales commissions and another for budget forecasting.

Saving a Document as Hidden To save a document as hidden, hide the document window with the Window Hide command, and then choose File Quit. When Microsoft Excel prompts you to save your changes, choose OK. The next time you open the document it will be hidden.

Opening a Workspace File Automatically You can set up Microsoft Excel so it opens certain documents every time you start the application. For example, your startup document could be a macro sheet or a workspace file. For information on opening documents automatically, see the following section, "Specifying a Startup Folder and Document."

You can also use a special type of macro that automatically opens a workspace file whenever you open a certain worksheet or macro sheet. Or you can use such a macro in a workspace file. For more information on this type of macro, see "Creating a Macro That Runs Automatically" in Chapter 20.

Specifying a Startup Folder and Document

Microsoft Excel automatically includes a folder called Excel Startup Folder in the System Folder of your Macintosh. If you place any of the following items in the Excel Startup Folder, they are opened automatically when you start Microsoft Excel:

- Worksheets
- Charts
- Macro sheets
- Add-ins
- Workspace files

Also, any templates in the Excel Startup Folder will be listed in the dialog box when you choose the File New command. The startup folder is especially useful for working with templates and custom applications written with Microsoft Excel macros.

You can also specify an additional startup folder. Each time you start Microsoft Excel, all Microsoft Excel documents in your additional startup folder are opened after the documents in the standard startup folder are opened. Use an additional startup folder if your organization wants to create a standard startup folder shared on a network server.

Specifying an additional startup folder

1. Choose File Open.
2. Select the Alternate Startup document in the Library folder in the folder containing Microsoft Excel.
3. Choose the Open button.
4. Type the pathname of the additional startup folder you want.
5. Choose OK.

Specifying a startup document for Microsoft Excel version 2.2

Generally, you should specify a document as a startup document by placing it in the Excel Startup Folder. However, for compatibility with Microsoft Excel for the Macintosh version 2.2, you can specify a startup document by placing it in the System Folder and naming it "Excel Startup."

1 Place in the System Folder the document you want Microsoft Excel to open automatically each time it starts.

2 Name the document "Excel Startup."

Canceling a startup document

To cancel your startup document, you can do one of three things:

- Move the startup document to another folder.
- Drag the startup document to the Trash.
- Change the name of your startup document (if you named it "Excel Startup").

MORE ABOUT

More About Specifying a Startup Folder and Document

Guideline

Using Subfolders in the Startup Folder Documents in subfolders contained in the startup folder are not opened when you start Microsoft Excel. You can use subfolders in the startup folder to store documents that support the documents in the startup folder.

Troubleshooting

Startup Document Not Opening If your startup documents do not open when you first start Microsoft Excel, make sure that you have:

- Placed your startup documents in the Excel Startup folder or in the additional startup folder you specified.

  or

- Placed the startup document in the System Folder and named the startup document "Excel Startup."

Creating and Using a Document Template

A template is a document you create as the basic pattern for other similar documents. For instance, you can create an expense report, save it as a template, and use the template to fill in the data that varies every month, quarter, or year.

You can use templates to create worksheets, charts, and macro sheets that have text, formulas, styles, and formats already in place in the newly created document. Templates are useful in your day-to-day work because they can help you:

- **Save time** Templates already have all your standard text, formulas, formatting, and styles in place so you don't have to copy or re-enter them for each document.
- **Create consistency** Templates make it easy to achieve consistency between reports, presentations, and applications, even if they are created by several different people.
- **Develop custom applications** Templates are handy for having predefined layouts, range names, and macros that run automatically already in place in your documents.

Online Help also provides information on creating and using a document template. To display online Help, choose the Window Help command. If you are using system software version 7.0 and the Help command does not appear on the Window menu, display Help by pointing to the Help menu icon and choosing the Microsoft Excel Help command. For information on a specific command, select the Commands topic. For information on using online Help, see "Using Help" in Chapter 1.

NOTE Templates function the same way as system software version 7.0 stationery documents. Templates created with Microsoft Excel are automatically recognized by the Finder as stationery documents.

Creating a Template

You can create a template based on an existing worksheet, chart, or macro sheet, or you can create a template from scratch in a new document. When you save a document as a template, you can save it in any folder, including your startup folder. If you save a template in your startup folder, the name of your template will automatically appear in the File New dialog box when you choose File New.

Creating a template

1 Create a worksheet, chart, or macro sheet with all the styles, formats, generic text, and macros you want in your template, or open a document that you want to use as a template.

2 Choose File Save As.

3 Type the name you want for the template.

4 Choose the Options button.

5 In the File Format box, select the Template option.

6 Choose OK.

7 Choose the Save button to close the File Save As dialog box.

Using a Template

When you open a template, Microsoft Excel automatically makes a copy of the template and displays the new document in the workspace. Changes you make affect only the copy; the original template is preserved.

When Microsoft Excel makes a copy of the template for you to use, it gives the document a temporary name. For example, if you have a tax report template named Tax, Microsoft Excel gives it the temporary name Tax1.

The copy of the template is a new, unsaved document. When you choose to save or close the document, the File Save As dialog box appears. You can type a new name for the document or accept the name suggested by Microsoft Excel.

Opening a template

The names of the templates you saved in your startup folder are automatically displayed in the File New dialog box when you choose File New. The File New dialog box lists the template names after the Worksheet, Chart, and Macro Sheet options. If you did not save your templates in your startup folder, you can open them with the File Open command.

NOTE When you create a new chart from a chart template, the data series that were used to create the chart on the template are not used for the new chart. Instead, the selection on the active worksheet is used to supply the data series for the new chart. Only the formatting characteristics of the template chart are used to create the new chart.

1 To open a template in the startup folder, choose File New.

To open a template in any other folder, choose File Open.

2 Select the template you want to open.

If you chose File Open and the template you want to open is not listed, switch to the folder containing the template by double-clicking the folder name in the list. For more information on changing drives and folders, see "Opening an Existing Worksheet" in Chapter 3.

3 Choose the Open button.

Microsoft Excel makes a copy of the template for you to use, displays it, and gives it the new temporary name.

Editing a Template

Once you have created a template, you can open the original template document any time you want to add, delete, or change an element in the template itself.

Editing a template

1 Choose File Open.

2 Select the template you want to edit.

If the template you want to edit is not listed, switch to the folder containing the template by double-clicking the folder name in the list. For more information on changing drives and folders, see "Opening an Existing Worksheet" in Chapter 3.

3 Hold down SHIFT and choose the Open button.

Microsoft Excel opens the original template document for editing.

4 Edit the template.

5 Choose File Save.

Microsoft Excel saves the changes to your template.

Deleting a Template

You delete a template the same way you delete any document. For more information on deleting documents, see "Deleting a Worksheet" in Chapter 3 or "Deleting a Chart" in Chapter 12.

Deleting a template

IMPORTANT The File Delete command cannot be reversed with the Edit Undo command. If you delete a template from your disk, you cannot retrieve it. However, File Delete removes the template from the disk, but not from memory. If you inadvertently delete a template that is open, you can save it on your disk again with the File Save As command because the template is still in memory.

To do this procedure, you must be using full menus.

1 Choose File Delete.

2 Select the template you want to delete.

If the template you want to delete is not listed, switch to the folder containing the template by double-clicking the folder name in the list. For more information on changing drives and folders, see "Opening an Existing Worksheet" in Chapter 3.

3 Choose the Delete button.

Microsoft Excel asks for confirmation before deleting the template. After you delete a template, the File Delete dialog box remains on the screen so you can select and delete other templates.

4 To close the dialog box, choose the Close button.

Creating a Custom Color Palette

Each Microsoft Excel document has a palette of 16 colors that you can apply to cells, fonts, gridlines, graphic objects, and items in a chart. You can customize the colors on the palette and copy color palettes between documents.

Online Help also provides information on creating a custom color palette. To display online Help, choose the Window Help command. If you are using system software version 7.0 and the Help command does not appear on the Window menu, display Help by pointing to the Help menu icon and choosing the Microsoft Excel Help command. For information on a specific command, select the Commands topic. For information on using online Help, see "Using Help" in Chapter 1.

Customizing colors in a color palette

You can customize the shade and intensity of the colors in the color palette for a worksheet, macro sheet, or chart. This lets you create different color schemes for documents. You need a color monitor to customize colors in the color palette. If you are using a monochrome monitor, the names of colors are displayed, instead of the colors themselves.

To do this procedure, you must be using full menus.

1 Choose Options Color Palette.

   If you are working with a chart, choose Chart Color Palette.

2 In the Color Palette box, select a color you want to change and choose the Edit button. You can also just double-click the color.

   The color wheel dialog box appears on your screen with the selected color displayed.

3 Select the new color you want.

   For information on using the color wheel dialog box, see your Macintosh documentation.

4 Choose OK.

5 Repeat steps 2 through 4 for each color you want to change.

6 Choose OK.

   Your color changes are applied to each object that uses the colors you changed.

Copying custom color palettes between documents

You can copy the color palette from one document to another to give sets of documents the same custom color scheme. For example, your organization can create a custom color template for all company presentations which matches your company's logo and image.

To do this procedure, you must be using full menus.

1 Open the document whose color palette you want to copy.

2 Activate the document to which you want to copy a color palette.

3 Choose Options Color Palette.

   If you are working with a chart, choose Chart Color Palette.

4 In the Copy Colors From box, select the name of the document from which you want to copy a color palette.

5 Choose OK.

MORE ABOUT

More About Creating a Custom Color Palette

Guidelines

Copying Colored Objects Between Documents When you copy an object with a custom color from one document to another, the number of the color on the color palette is copied with the object. For example, if an object has the third color in the palette (default red) and is copied to another document where the third color is orange, the object changes colors from red to orange.

Resetting the Color Palette The Default button in the Options Color Palette dialog box resets the colors of the palette to the original 16 colors.

Tips

Creating Colors for a Set of Documents If you want to create a consistent design and appearance for a set of documents, create and store a color palette along with the cell styles in a master template. This way, you can be sure all your documents have the same styles and colors. For information on cell styles, see "Formatting with Cell Styles" in Chapter 5. For information on templates, see "Creating and Using a Document Template," earlier in this chapter.

Using Custom Colors in Custom Formats To include a color from the color palette in a custom number format, type within brackets **color** and the number of the color from the color palette in the custom format. The colors in the color palette are numbered 1 through 16 by column, starting with the upper-left color. For example, to format numbers and text to use the General format and to appear in the color in the upper-right corner of the Color Palette box, create the following custom format:

General [color 9]

You can also use the color names black, white, red, green, blue, yellow, magenta, and cyan within brackets in a custom number format. If you use a color name in a format, text or numbers in that format will always have that color. If you use a number from the color palette in a format, text and numbers in that format will change whenever the corresponding color is changed in the palette.

Protecting Documents and Windows

Protecting documents and windows helps safeguard against errors caused by accidental or unauthorized changes. This is important if the document contains sensitive information or if it must be shared by several users. You use different passwords with each of the different types of protection, so you can control exactly which privileges others have for a document. You can protect a document under the following circumstances:

- **While it is stored on disk** You can use a *protection password* to prevent someone from opening a document or accessing linked data from a document, or a *write reservation password* to prevent someone from saving changes to a document.
- **While it is open in Microsoft Excel** You can prevent someone from changing a document's contents, objects, windows, or any combination of these.

Preventing Document Files from Being Opened or Saved

You can protect document files on the disk with passwords so that only those who know the password can open or save changes to the document file. Passwords in Microsoft Excel are case-sensitive; can contain any combination of letters, numbers, and symbols; and can be up to 15 characters long.

Preventing a document from being opened

When you limit access to a document by assigning a password to it, the password is required to open the document. The password is also required for any linked documents to read data from the document.

1. Open or activate the document.
2. Choose File Save As.
3. Choose the Options button.
4. In the Protection Password box, type a password.

   A dot appears in the Protection Password box for each character you type.
5. Choose OK.

   A dialog box appears asking you to retype the password to confirm it.
6. Retype the password.
7. Choose OK.

   Microsoft Excel closes the password confirmation dialog box. The File Save As dialog box remains on the screen.
8. Choose the Save button.

   If you have already saved the document with the same name in the same folder, Microsoft Excel displays a message asking if you want to replace the existing document. To replace the saved document with the open document, choose the Yes button. To cancel the save so you can type a new name in the File Save As dialog box, choose the No button.

When you open that document in the future, Microsoft Excel requires you to type the correct password.

IMPORTANT If you forget a password, you cannot open the document or remove protection from the document. It's a good idea to keep a list of your passwords and their corresponding document names in a safe place.

Preventing changes from being saved

You can protect a document so that anyone can open the document but only those who know the password can save changes to the document. Those who do not know the password must turn on the Read Only check box in the File Open dialog box to open the document. Whenever anyone tries to open the document with write permission (with the Read Only check box turned off), Microsoft Excel asks for the password. If the document is opened with the Read Only check box turned on and changes are made to it, the existing document cannot be replaced with the changed document, but the changed document can be saved as a new document with a new name.

1. Open or activate the document.
2. Choose File Save As.
3. Choose the Options button.
4. In the Write Reservation Password box, type a password.

   A dot appears in the Write Reservation Password box for each character you type.
5. Choose OK.

   A dialog box appears asking you to retype the password to confirm it.
6. Retype the password to confirm it.
7. Choose OK.

   Microsoft Excel closes the password confirmation dialog box. The File Save As dialog box remains on the screen.
8. Choose the Save button.

   If you have already saved the document with the same name in the same folder, Microsoft Excel displays a message asking if you want to replace the existing document. To replace the saved document with the open document, choose the Yes button. If you want to cancel saving so you can type a new name in the File Save As dialog box, choose the No button.

NOTE If a document has been saved with a write reservation password, no other document can be saved with the same name to replace the protected document.

Removing password protection

1 Open or activate the document.

2 Choose File Save As.

3 Choose the Options button.

4 In the Protection Password box or in the Write Reservation Password box, select the password.

5 Press DELETE to remove the password.

6 Choose OK.

The File Save As dialog box remains on the screen.

7 Choose the Save button.

If you are saving the document with the same name in the same folder, Microsoft Excel displays a message asking if you want to replace the existing document. To remove the protection from the saved document, choose the Yes button. If you want to cancel saving so you can type a new name for the unprotected document, choose the No button.

Recommending that a document be read-only

You can have Microsoft Excel recommend that users open a document as read-only so they know they should not be changing a document unless necessary. You can use this as a protection method that is less strict than adding password protection, or to reinforce the password protections you have already applied. Only one person at a time can open the document with write permission; recommending that a document be opened read-only can also be used to remind users of a shared network document to open the document read-only when they don't need to make changes to the document but other users might.

1 Open or activate the document.

2 Choose File Save As.

3 Choose the Options button.

4 Turn on the Read-Only Recommended check box.

5 Choose OK.

The File Save As dialog box remains on the screen.

6 Choose the Save button.

If you have already saved the document with the same name in the same folder, Microsoft Excel displays a message asking if you want to replace the existing document. To replace the saved document with the open document, choose the Yes button. If you want to cancel saving so you can type a new name in the File Save As dialog box, choose the No button.

Controlling Changes to Open Documents

In addition to controlling whether or not a document can be opened or saved, you can control whether or not cells, graphic objects, or windows can be changed while the document is open.

Protecting specific cells is useful when creating models or templates that you want other people to be able to fill in but not rearrange or format. You can protect worksheet cells by locking or hiding them.

- *Locking* a cell prevents its contents from being changed.
- *Hiding* a cell prevents the cell's formula from being displayed in the formula bar when the cell is selected; only the result of the formula is displayed.

Protecting graphic objects locks the objects so they cannot be selected, moved, sized, or formatted. You may want to protect objects once your document layout is complete to prevent objects from being changed accidentally.

NOTE Microsoft Excel moves and/or sizes a locked graphic object with the underlying cells if you have used the Format Object Placement command to format the graphic object to move and size with cells or to move with cells.

Protecting a document's window prevents others from sizing or moving, opening, or closing individual windows into the document. Protect windows when you protect a document if you want to make sure that a document's windows are always sized and positioned the same each time the document is opened.

When protecting cells and graphic objects, you must do two things:

- Set the protection status of the worksheet cells and graphic objects with the Format Cell Protection or Format Object Protection command.
- Choose the Options Protect Document or Chart Protect Document command to put into effect the protection status you specified. You also use these commands to turn protection of the document window on or off.

Setting the protection status of worksheet cells

To protect cells, you first set the protection status of the cells to locked and/or hidden as described in the following procedure, and then you turn on document protection to put into effect the protection status of all the cells on the worksheet. When you create a new worksheet or macro sheet, the protection status for all cells is initially set as locked and not hidden.

To do this procedure, you must be using full menus.

1 Select the cell or cells whose protection status you want to change.

2 Choose Format Cell Protection.

3 Set the protection as you want by turning on or turning off the Locked and Hidden check boxes.

4 Choose OK.

Setting the protection status of graphic objects

To protect graphic objects, you first set the protection status of the objects to locked as described in the following procedure, and then you turn on document protection to put into effect the protection status of all the objects on the worksheet or macro sheet, including any chart that has been created as a graphic object on the sheet. When you add an object, the protection status of the object is initially set as locked.

To do this procedure, you must be using full menus.

1 Select the graphic object or objects whose protection status you want to change.

2 Choose Format Object Protection.

3 Set the protection as you want by turning on or turning off the Locked check box.

To protect the contents of a text box, turn on the Lock Text check box.

4 Choose OK.

Turning on document and window protection

Once you have set the protection status for worksheet cells and graphic objects, you must turn on document protection for those settings to take effect. When you turn on document protection, you can also choose whether or not to protect the document windows. Document protection affects only the active document.

To do this procedure, you must be using full menus.

1 If you want to protect the document windows, you should size and position the document window or windows the way you want.

2 If the active document is a worksheet or macro sheet, choose Options Protect Document.

If the active document is a chart, choose Chart Protect Document.

3 To protect cells on a worksheet or macro sheet, turn on the Cells check box.

To protect objects on a worksheet or macro sheet, including any embedded chart on the sheet, turn on the Objects check box.

To protect the contents of a chart that is in its own document window, turn on the Chart check box.

To protect the document window, turn on the Windows check box.

4 To prevent others from turning off the protection, type a password in the Password box. A dot appears in the Password box for each character you type.

If you just want to protect the document from yourself to avoid accidental changes, you may not want to type a password. If you don't type a password, you won't have to type a password when you want to turn off document protection.

5 Choose OK.

6 If you typed a password, retype the password to confirm it.

7 Choose OK.

IMPORTANT If you typed a password, you should note the password and the document name in a safe place, because you will need the password to turn off document protection.

Turning off document protection

To make changes to locked or hidden cells, locked graphic objects, or protected windows, you must turn off document protection.

To do this procedure, you must be using full menus.

1 If the active document is a worksheet or macro sheet, choose Options Unprotect Document.

If the active document is a chart, choose Chart Unprotect Document.

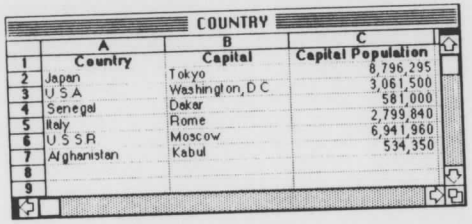
2 If the document is protected with a password, type the password in the Password box and choose OK.

MORE ABOUT

More About Protecting Documents and Windows

Guidelines

Appearance of Protected Windows A window protected with the Options Protect Document or Chart Protect Document command does not display the close box or the zoom box:



MORE ABOUT

Appearance of Unlocked Cells on a Protected Worksheet or Macro Sheet If you turn off gridlines with the Options Display command, Microsoft Excel underlines any unlocked cells on the protected worksheet or macro sheet. If you have used the Format Border command to add borders that appear along the bottom of unlocked cells, Microsoft Excel does not display the underlines for those unlocked cells but displays the borders instead.

Moving Between Unlocked Cells To move between unlocked cells on a protected worksheet or macro sheet, press TAB.

Creating and Using Custom Worksheet Functions

A custom function is a function you create on a macro sheet by combining formulas and Microsoft Excel built-in functions. You use custom functions as you would use a built-in worksheet function such as SUM; however, because you create the custom function, you decide exactly what it does. Any formula or set of formulas that you can enter on your worksheets can be written as a custom function on a macro sheet.

Use a custom function when you want to simplify specialized calculations that you perform often. Custom functions make your worksheets smaller by storing in just one place a specialized formula that you use in many places. For example, you could create a custom function to calculate the profit on a sale. Then, instead of using individual formulas whenever you want to calculate profit on an income worksheet, you could just use the custom function.

NOTE Unless otherwise noted, you edit, format, and print macro sheets using the same procedures you use for worksheets.

Table of Contents

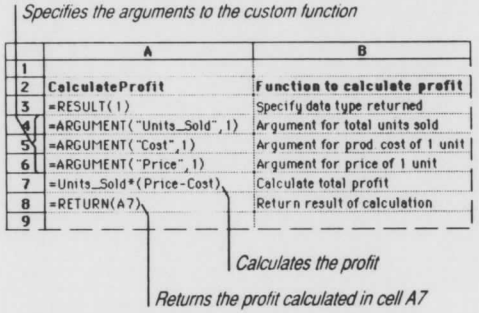
Designing a Custom Function ... 563
Writing a Custom Function ... 570
Using a Custom Function ... 573

Designing a Custom Function

When creating a custom function, you need to design the following three parts:

- Arguments to the function
- Formulas in the function
- Values returned by the function

For example, a custom function to calculate profit on a sale looks like this:



Designing the Arguments of a Custom Function

Like Microsoft Excel's built-in functions, custom functions take arguments. To define the arguments your custom function will use, you use the ARGUMENT function. You must enter one ARGUMENT function for each argument your custom function uses. The first ARGUMENT function corresponds to the first argument given, the second to the second argument, and so on. The ARGUMENT functions must come at the beginning of the custom function.

Using the ARGUMENT function, you define a name, such as "Units_Sold" or "Cost," for the value of that argument. Other formulas on the macro sheet can then use that name to refer to the argument value. You also use the ARGUMENT function to specify what types of data the custom function can accept.

The ARGUMENT function uses the following syntax:

ARGUMENT(*name_text*,*data_type_num*,*reference*)

- **The *name_text* argument** The *name_text* argument specifies the argument name. This argument is optional if you specify the *reference* argument.

  You can use the same argument name, specified in *name_text*, for different arguments in different custom functions on a macro sheet, but remember that a name can have only one definition at a time. Therefore, if one custom function calls another custom function on the same macro sheet, the arguments to the two custom functions should have different names. Otherwise, when the second function is called, it will change the definitions of the names that may be used later in the first function.

  Be careful not to use names for arguments if those names are used elsewhere in the custom function as nonargument names. For example, if a cell is named Months on your macro sheet, then no arguments on the macro sheet should use the name Months.

The argument names defined in a custom function remain as defined names after the custom function is calculated. After calculating a custom function, you can use the Formula Define Name command to find out the definitions of the names used in the custom function.

- **The *data_type_num* argument** (Optional) The *data_type_num* argument specifies that the argument entered in the custom function must be of a certain type, such as a number, text, or logical value.

  The argument data type is specified by a number as follows:

Value	Data type
1	Number
2	Text
4	Logical
8	Reference
16	Error
64	Array

  The argument can be anything—formula, reference, constant—that produces a result of the specified data type. For example, an argument that is supposed to be a number could be supplied as a formula that evaluates to a number, or a reference to a cell that contains a number. If an argument data type is specified to be an array, you can enter a reference to a range of cells as the argument; Microsoft Excel passes the array of values stored in that range.

  If the argument given with the custom function does not match the data type you specified, Microsoft Excel first attempts to convert it to the specified type. If it cannot be converted, the custom function does not run and returns the #VALUE! error value.

  When using the *data_type_num* argument to the ARGUMENT function, you can specify that the argument accept more than one data type by adding together the values for different data types. For example, you may want an argument to accept either a number or text. The type for that argument should be 3—the sum of 1 and 2.

  If you do not specify a data type in the ARGUMENT function, Microsoft Excel assumes the data type to be 7, meaning that single numbers, text, and logical values are allowed.

- **The *reference* argument** The *reference* argument specifies a reference to a cell or cell range on the macro sheet. This argument is optional if you specify the *name_text* argument.

  When the *reference* argument is included, Microsoft Excel places the argument value in the referenced cell or range. You can then refer to those cells in other formulas in the custom function.

When you use *reference* in an ARGUMENT function, make sure the reference is the right size for the argument to be passed, and that the cells specified in *reference* are available to contain the argument and do not contain other formulas or constants. If the argument is supposed to be a single value, *reference* should be a reference to a single cell. If the argument is supposed to be an array, *reference* must be a reference to a range of cells large enough to contain the entire array. Note that you can save space on the macro sheet by using the *name_text* argument to define a name for the array, rather than entering it in cells on the macro sheet.

When a reference is passed to a custom function as an argument, it is passed as an external reference. For example, suppose you have the CALCULATE_PROFIT custom function on a macro sheet named Macros, and CALCULATE_PROFIT takes a reference as an argument. If you enter the formula =Macros!CALCULATE_PROFIT(A1) on a worksheet named Budget, the reference that is passed to the CALCULATE_PROFIT function on the macro sheet is the external reference Budget!A1.

NOTE You cannot use the *reference* argument if you used *data_type_num* to specify the custom function argument as a reference, because Microsoft Excel cannot place the reference in a cell or range in this case.

For more information on the ARGUMENT function, see the *Microsoft Excel Function Reference*.

Designing the Formulas of a Custom Function

You design the formulas in a custom function as you would any set of formulas on a worksheet. The same rules and guidelines apply. In addition, remember that formulas on a macro sheet are calculated in order down a column. It's especially important to avoid unintentional circular references and to document your formulas. For information on creating formulas, see "Entering a Formula" in Chapter 3. For information on documenting your formulas, see Chapter 6, "Organizing and Documenting a Worksheet" and "Documenting a Command Macro" in Chapter 19.

Designing the Results of a Custom Function

In addition to specifying data types for the arguments in a custom function, you can specify data types for the results of a custom function. To do so, you use the RESULT function. This function is optional unless you want to return an array or a reference, in which case you must use the RESULT function.

The RESULT function, if used, must come before any other formulas in the custom function, including the ARGUMENT functions.

The form of the RESULT function is:

RESULT(*type_num*)

Type_num specifies the data type of the value returned by the custom function. The values used to specify the different data types are the same as for specifying the data type of an argument. For a list of data type numbers, see "Designing the Arguments of a Custom Function," earlier in this section.

If the value returned by the custom function is not the same type specified by the RESULT function, Microsoft Excel first attempts to convert it to the specified type. If it cannot be converted, the custom function returns the error value #VALUE!.

You can specify that the custom function can return more than one data type as a result by adding together data type numbers. For example, if you want the result to be either text or a logical value, use the data type number 6—the sum of 2 and 4. If you omit the RESULT function, Microsoft Excel assumes the result type to be 7, meaning that single numbers, text, and logical values are allowed.

Using Arrays in a Custom Function

Before you can pass an array argument to a custom function, you must use *data_type_num* in the ARGUMENT function to specify that the argument is an array. If an argument to a custom function is not specified as an array, the argument must be a single value. If you enter an array range for an argument that is not specified as an array, Microsoft Excel returns the error value #VALUE!. If you enter an array constant for an argument that should be a single value, Microsoft Excel uses the first value in the array constant.

If you want to obtain the values of individual elements in the array, use the INDEX function and the name of the array. For information on the INDEX function, see the *Microsoft Excel Function Reference*.

Occasionally, you may want to change individual values within an array argument during calculation of your custom function. In that case, you must specify *reference* in the ARGUMENT function so that Microsoft Excel enters the array of values on the macro sheet. Then you can use the SET.VALUE function to change individual values in the array. For information on the SET.VALUE function, see the *Microsoft Excel Function Reference*.

The size of *reference* specified in the ARGUMENT function is the limit on the size of the array that can be passed to the custom function as an argument. You should make sure that *reference* specifies a range large enough for the largest array that might be passed as an argument, and that anyone using the function is aware of the size limit of the array. When an array is passed that is smaller than *reference*, only some of the cells in *reference* are filled with values. In that case, when you specify ARGUMENT(*name_text,data_type_num,reference*), the argument name specified by *name_text* is defined only for the cells actually filled by the array, not for the entire area specified by *reference*. If you need to find out the actual size of the array passed, you can use the ROWS and COLUMNS functions with the argument name. For information on the ROWS and COLUMNS functions, see the *Microsoft Excel Function Reference*.

In a custom function that returns an array, it is common to have the custom function enter the values into a range of cells on a macro sheet and then return that array of values with the RETURN function. If the array of values is larger than the size of the area reserved for it, the function uses the portion of the array that fits in *reference*.

MORE ABOUT

More About Designing a Custom Function

Guidelines

Maximum Number of Arguments A custom function can accept a maximum of 13 arguments.

Returning More Than One Value If a custom function must return more than one value, the values must be returned in an array. For more information, see "Designing the Results of a Custom Function," earlier in this section. For information on arrays, see "Creating and Using an Array Formula" in Chapter 7.

Tips

Put Optional Arguments Last Some arguments to a custom function may not be required to complete the custom function's calculations. Such arguments are called *optional arguments* and should follow the required arguments for your function. Functions with optional arguments placed at the end are easier to use than those with optional arguments mixed with required ones.

Anticipate Mistakes by Users While designing your custom functions, anticipate possible mistakes by those using your custom function. Here are some mistakes you should anticipate and accommodate in designing your custom function:

- **An incorrect value specified as an argument** Test values to be sure they do not exceed the minimum or maximum values allowed by the formulas using the argument. Also test for any values that aren't allowed in the formulas of your custom function, such as zeros or negative values. You can use the =, <, and > operators and the AND and OR functions to test the value specified for an argument. For example, to test whether an argument called Divisor equals zero, include the following formula in your custom function after the ARGUMENT functions:

  =IF(Divisor=0,RETURN(#DIV/0))

MORE ABOUT

- **An incorrect size specified for an array** Make sure arrays used as arguments are the proper size. You can use the COLUMN, COLUMNS, ROW, and ROWS functions to test the size of an array. For example, if an array named Rate is used as an argument and it must be at least three rows by three columns, you can test the size of the array by including the following formula in your custom function after the ARGUMENT functions:

  =IF(OR(COLUMNS(Rate)<3,ROWS(Rate)<3),RETURN(#VALUE!))

- **A missing argument** Microsoft Excel uses the error value #N/A for any missing arguments. When designing your functions, make sure to test for #N/A being used as an argument, but be sure to allow #N/A to be used as a value for optional arguments.

  To test if the error value #N/A has been used for a required argument, include the following formula in your custom function after the ARGUMENT functions:

  =IF(ISNA(*value*),RETURN(#VALUE!))

  Value is the argument name specified in the ARGUMENT function you want tested. Include one such formula for each required argument in the cus-tom function. Do not include this formula for optional arguments.

Return Useful Error Values When your custom function encounters an error it cannot accommodate, make sure it returns an error value that helps you correct the error. Use the ISERR and ISERROR functions to test for errors; then use the RETURN function to return a descriptive error value based on the outcome of the ISERR and ISERROR functions.

You can copy Microsoft Excel's error messages, such as #NAME?, #VALUE!, and #N/A. For example, you could use the following function to test the width of an array range and return the error value #VALUE! if the array range is not wide enough to hold all the array values:

=IF(COLUMNS(*array*)<3,RETURN(#VALUE!))

For more information on these functions, see the *Microsoft Excel Function Reference*.

Determining the Data Type of a Custom Function Argument After a value for an argument has been passed to a custom function, you can find out its data type with the TYPE function. For more information on the TYPE function, see the *Microsoft Excel Function Reference*.

Writing a Custom Function

Write a custom function when you want to simplify specialized calculations that you perform often. Custom functions also make your worksheets smaller by storing in just one place a specialized formula that you use in many places.

There are two steps to creating a custom function:

- Create a new macro sheet or open an existing one and write the custom function using Microsoft Excel worksheet functions, macro functions, and formulas.
- Name the custom function as a function using the Formula Define Name command.

Microsoft Excel calculates the formulas in a custom function beginning in the first cell of the custom function and proceeding down the column until it encounters a RETURN function. Therefore, always enter the formulas for your custom function in a column.

For more information on macro sheets, see "Creating and Opening a Macro Sheet" in Chapter 18.

Creating a new macro sheet

1 Choose File New.

2 In the New box, select the Macro Sheet option.

3 Choose OK.

Opening an existing macro sheet

1 Choose File Open.

2 Select the macro sheet you want to open.

If the macro sheet you want to open is not listed, switch to the folder containing the macro sheet by double-clicking the folder name in the list. For more information on changing drives and folders, see "Opening an Existing Worksheet" in Chapter 3.

3 Choose the Open button.

Entering a custom function

To enter a custom function, you enter formulas in cells on a new or existing macro sheet.

1 Open a new or existing macro sheet.

2 If you want to specify the data type returned by the custom function, enter a formula that contains the RESULT function.

3 For each argument in the custom function, enter a formula that contains the ARGUMENT function.

4 Enter the formulas that carry out the custom function's calculation.

5 End the custom function with a formula that contains the RETURN function. This function returns the result of the macro calculation to the worksheet or macro sheet cell in which you use the custom function.

Naming a custom function

Before you use a custom function in a formula on a worksheet, you must define a name for it.

1 Select the first cell of the custom function on the macro sheet.

2 Choose Formula Define Name.

When a macro sheet is active, the Formula Define Name dialog box has options for naming custom functions.

3 In the Name box, type a name for the custom function.

4 Select the Function option.

5 Choose OK.

More About Writing a Custom Function

MORE ABOUT

Guidelines

Recording You cannot use the recorder to enter custom functions.

How Microsoft Excel Calculates Macro Sheets When calculating the cells in a custom function, Microsoft Excel performs one of two actions, depending on the contents of the cell:

- If a cell contains a formula that produces a value, Microsoft Excel calculates the formula and enters the value in the cell.
- If a cell contains a constant value, such as a number or a text value, Microsoft Excel skips over it to the next cell.

MORE ABOUT

If the custom function is called by a function during the calculation of a worksheet or macro sheet formula, the RETURN function ends the custom function and can return values to the function that called the custom function. Then, Microsoft Excel continues its calculation of formulas on the worksheet or macro sheet.

How Microsoft Excel Calculates Array Formulas in Macro Sheets A formula in a custom function may be an array formula that is entered into one or more cells. In calculating a custom function, if Microsoft Excel encounters the upper-left corner of a range of cells containing an array formula, it calculates the array formula just as it would any other formula. It then continues calculation below the lower-left corner of the array formula. If Microsoft Excel encounters a cell in an array formula that is not the upper-left corner cell, it does not calculate the formula but continues calculation below the array formula.

For example, suppose that cells C3:E5 on a macro sheet contain an array formula and that Microsoft Excel is currently calculating cell C2. Next, it goes to cell C3 and calculates the array formula in all of cells C3:E5. Then, it continues calculation at cell C6. If Microsoft Excel were currently calculating D2, however, it would skip over the array formula and continue calculation at cell D6.

Tips

Displaying Values on a Macro Sheet You can quickly switch a macro sheet from displaying formulas to displaying values, and back again, by pressing the shortcut key COMMAND +` (single left quotation mark). Displaying values is helpful while testing and correcting custom functions.

Creating Add-in Functions You can create and save custom functions as add-in functions, which you can use to create custom applications that seem to be a part of Microsoft Excel. Custom functions saved as add-in functions appear as built-in worksheet functions in the list of functions in the Formula Paste Function dialog box. For information on creating add-in functions, see "Creating Add-in Functions and Command Macros" in Chapter 20.

Document Your Custom Functions You should document your custom functions so that others can use them. Be sure to describe all data types, minimum and maximum values, and sizes of arrays. You can intersperse comments among the cells of the macro, write them in a column next to the macro, or place them in cell notes. All worksheet editing and formatting commands work on macro sheets as well. For information on documenting worksheets and macro sheets, see Chapter 6, "Organizing and Documenting a Worksheet" and "Documenting a Command Macro" in Chapter 19.

Using a Custom Function

To use a custom function in a worksheet or macro sheet formula, enter the name of the macro sheet that contains the custom function, followed by an exclamation point and the function name you defined with the Formula Define Name command. Following the function name, include a left parenthesis, the function arguments separated by commas, and a right parenthesis. For example, you could enter **=Macros1!CALCULATE_PROFIT (30000,3,5)**

There are two ways to enter a custom function in a formula: you can type the function into the formula or you can use the Formula Paste Function command. Custom functions from all open macro sheets appear at the end of the list of functions in the Formula Paste Function dialog box. Before you can use a custom function, you must open the macro sheet containing the custom function you want to use.

Pasting a custom function

Make sure the macro sheet containing the custom function is open.

1. To insert a function at the beginning of a formula, select the cell into which you want to enter the formula.

   To insert a function elsewhere in the formula, position the insertion point where you want to insert the function and type the preceding operator or left parenthesis.

2. Choose Formula Paste Function.

   Microsoft Excel displays a dialog box that lists all of the available worksheet functions. Your custom functions appear at the end of the list, preceded by the name of the macro sheet containing the custom function.

3. Select the function you want to paste.

   The function and its arguments are shown below the list of available functions. Microsoft Excel pastes placeholders to remind you what arguments are needed for the function. If you don't want placeholders, turn off the Paste Arguments check box.

4. Choose OK.

5. Type or edit the arguments.

   You must replace placeholders with real arguments. If there is more than one argument, make sure they are separated with commas. If you omit an optional argument, leave its comma in place.

6. When you finish editing the formula, click the enter box or press ENTER.

MORE ABOUT

More About Using a Custom Function

Guidelines

Deleting a Custom Function When you want to delete a custom function, you should first make sure that none of your formulas still contain the function. Then, on the macro sheet on which the custom function is written, clear the cells that contain the formulas for the custom function, and delete the name of the custom function in the Formula Define Name dialog box.

Custom Functions vs. Add-in Functions Regular custom functions appear at the end of the list of functions in the Formula Paste Function dialog box and are preceded by a macro sheet name and an exclamation point. Custom functions stored on an add-in macro sheet appear in alphabetical order in the list of functions in the Formula Paste Function dialog box and are not preceded by a macro sheet name or an exclamation point. For information on add-in functions, see "Creating Add-in Functions and Command Macros" in Chapter 20.

Tips

Opening a Macro Sheet Automatically When You Start If you have a set of custom functions that you use often, you might want to have them all on a macro sheet that opens automatically every time you start Microsoft Excel. For information on opening documents automatically when you start Microsoft Excel, see "Specifying a Startup Folder and Document" in Chapter 16.

Troubleshooting

If You Can't Find Your Custom Functions If after opening a macro sheet you do not see the names of your custom functions at the bottom of the list of functions in the Formula Paste Functions dialog box, make sure that you have the right macro sheet open and that you named and defined your custom functions using the Function option in the Formula Define Name dialog box. For information on naming custom functions, see "Writing a Custom Function," earlier in this chapter.

#N/A Errors If you omit a required argument in a custom function, Microsoft Excel uses the error value #N/A as the value of the argument. If you received an #N/A error value when using a custom function, make sure you have specified all the arguments needed for the function. Microsoft Excel also uses the #N/A error value to show that nothing was returned.

Automating Tasks with Command Macros

With Microsoft Excel you can record a sequence of commands and then play it back when you want to use that command sequence again. This stored sequence of commands is called a *command macro*. Command macros greatly improve the speed and accuracy of your work. You can run any command macro by using the Macro Run command or by pressing the shortcut key if a shortcut key has been defined for the macro. You can also assign a command macro to a button or other graphic object you place on your worksheets.

NOTE Unless otherwise noted, you edit, format, and print macro sheets using the same procedures you use for worksheets.

Table of Contents

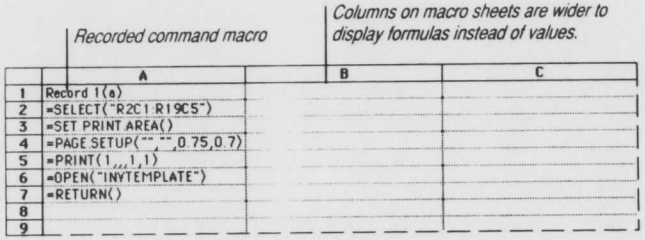
Creating and Opening a Macro Sheet ... 575
Recording a Command Macro ... 578
Running a Command Macro ... 582
Editing a Command Macro ... 584
Assigning a Command Macro to a Button or Other Graphic Object ... 584

Creating and Opening a Macro Sheet

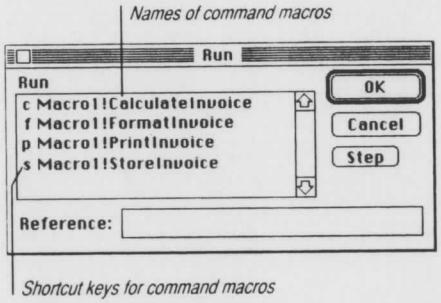
Microsoft Excel command macros are created and stored on macro sheets. A macro sheet looks like a worksheet but has wider columns for writing and storing macros. Custom functions are also stored on macro sheets.

You use the same procedures in working with macro sheets that you use with worksheets. All the familiar tasks—entering formulas, editing cells, formatting cells, and saving documents—are the same for macro sheets as they are for worksheets. Microsoft Excel stores command macros in separate documents so

you can use your macros with whatever documents you have open. By default, macro sheets display formulas rather than their resulting values as shown in the following illustration:



Before you can use a command macro, the macro sheet that contains it must be open. You can see a list of the command macros available on all open macro sheets by choosing the Macro Run command:



Microsoft Excel calculates macro sheets differently than worksheets. For more information, see "More About Creating and Opening a Macro Sheet," later in this section.

Online Help also provides information on creating and opening a macro sheet. To display online Help, choose the Window Help command. If you are using system software version 7.0 and the Help command does not appear on the Window menu, display Help by pointing to the Help menu icon and choosing the Microsoft Excel Help command. For information on a specific command, select the Commands topic. For information on using online Help, see "Using Help" in Chapter 1.

Creating a new macro sheet

Create a new macro sheet when you want to create and store any new group of command macros. Keeping groups of command macros on their own macro sheet helps you build a library of macros used for various tasks.

1 Choose File New.

2 In the New box, select the Macro Sheet option.

3 Choose OK.

Opening an existing macro sheet

Open an existing macro sheet to use the command macros stored on the macro sheet.

1 Choose File Open.

2 Select the macro sheet you want to open.

If the macro sheet you want to open is not listed, switch to the folder containing the macro sheet by double-clicking the folder name in the list. For more information on changing drives and folders, see "Opening an Existing Worksheet" in Chapter 3.

3 Choose the Open button.

Any command macros stored on the macro sheet appear in the list in the Macro Run dialog box.

More About Creating and Opening a Macro Sheet

MORE ABOUT

Guideline

How Microsoft Excel Calculates a Command Macro Microsoft Excel calculates the formulas in a command macro beginning in the first cell of the macro and proceeding down the column until a RETURN function, HALT function, or the end of the column is encountered.

If you run a command macro using the Macro Run command or the keyboard shortcut for the command macro, the RETURN function ends the command macro. If the command macro is called by a function during the calculation of a macro sheet formula, the RETURN function ends the command macro and can return values to the formula. Then, Microsoft Excel continues its calculation of formulas on the worksheet or macro sheet.

MORE ABOUT

When calculating the cells in a command macro, Microsoft Excel performs one of the following three actions, depending on the contents of the cell:

- If a cell contains a formula that performs an action, Microsoft Excel calculates the formula and performs the action.
- If a cell contains a formula that returns a value, Microsoft Excel calculates the formula and returns the value.
- If a cell contains a constant value, such as a number or a text value, Microsoft Excel skips over it to the next cell.

Tips

Displaying Values on a Macro Sheet You can quickly switch a macro sheet from displaying formulas to displaying their resulting values by pressing COMMAND+` (single left quotation mark). Displaying values is helpful while testing and correcting command macros.

Creating Custom Applications You can create and save command macros as add-in command macros, which can be used in creating custom applications in Microsoft Excel. For information on creating add-in command macros, see "Creating Add-in Functions and Command Macros" in Chapter 20.

Recording a Command Macro

With Microsoft Excel, it's easy to create a command macro—you just turn on the macro recorder and carry out the commands and actions you want the macro to perform. The macro recorder enters each instruction of the command macro for you in the *recorder range*, which is the range on the macro sheet where Microsoft Excel stores the macro. You can designate the recorder range yourself with the Set Recorder command, or have Microsoft Excel determine the recorder range automatically when you start recording.

Each command and action you take is recorded on the macro sheet as a *macro function*. When you run the command macro, the macro functions perform the commands and actions you recorded. For information on the macro functions, see the *Microsoft Excel Function Reference*.

Each action you take, such as entering a formula or making a new selection, takes up one cell in the recorder range. The macro recorder records only in cells that are empty or contain a RETURN function. If Microsoft Excel encounters a non-blank cell other than one containing a RETURN function while recording in the recorder range, you will see a message that the recorder range is full.

Online Help also provides information on recording a command macro. To display online Help, choose the Window Help command. If you are using system software version 7.0 and the Help command does not appear on the Window menu, display Help by pointing to the Help menu icon and choosing the Microsoft Excel Help command. For information on a specific command, select the Commands topic. For information on using online Help, see "Using Help" in Chapter 1.

Recording a command macro

You can record any series of actions as a command macro. You can then use the command macro whenever you need to repeat that series of actions. Before you start recording a command macro, plan the steps involved and the commands and actions you want to include. While you record your actions, each command or action you carry out is recorded as a function on the macro sheet. After recording a command macro, you can edit it to fix any mistakes you made during recording. By default, Microsoft Excel records references in macros as absolute references in quoted R1C1 style.

1. Choose Macro Record. If no documents are open, choose the Record Macro command on the File menu.

   In the dialog box, Microsoft Excel proposes a name and shortcut key combination you can use later to run the command macro.

2. Make any changes you want in the proposed name and shortcut key.

   Make sure the name you specify is a valid Microsoft Excel name and that the shortcut key is a single letter. If you are using an international version of Microsoft Excel, make sure the shortcut key is a single letter without accent, umlaut, or cedilla.

3. Choose OK.

   If a macro sheet was not open when you chose Macro Record, Microsoft Excel creates a new macro sheet. Microsoft Excel enters the macro name in the recorder range and starts recording. If the status bar is on, a message appears telling you that Microsoft Excel is recording.

4. Carry out the actions you want recorded in the command macro.

5. When you are finished, choose Macro Stop Recorder.

Pausing while recording a command macro

While recording a command macro, you can stop the recorder so you can carry out commands that you don't want recorded.

To do this procedure, you must be using full menus.

1. Choose Macro Stop Recorder.
2. When you want to start recording again, choose Macro Start Recorder.

Defining the macro recorder range yourself

You can select your own recorder range for recording a command macro. The cells you select must be blank.

To do this procedure, you must be using full menus.

1 Select a blank cell or range on the macro sheet.

2 Choose Macro Set Recorder.

If you selected just one cell, Microsoft Excel uses the entire column, from the cell you selected down, as the recorder range; otherwise, Microsoft Excel uses the range you selected as the recorder range.

MORE ABOUT

More About Recording a Command Macro

Guidelines

How Microsoft Excel Determines the Recorder Range When you choose the Macro Record command, Microsoft Excel checks to see if there is a recorder range defined on an open macro sheet. If there is a recorder range defined and the first cell in that range is blank, Microsoft Excel records the command macro in that range.

If there is no recorder range defined, Microsoft Excel starts recording in the first column that is completely empty on the macro sheet. If no macro sheet is open, Microsoft Excel opens a macro sheet, and starts recording in the first column.

Microsoft Excel automatically sets a new recorder range after recording a command macro with the Macro Record command. When you stop recording the command macro, Microsoft Excel redefines the recorder range to be the next completely empty column on the macro sheet.

Multiple Columns in Recorder Range If your recorder range is more than one column wide, recording proceeds down the columns in order. Microsoft Excel enters a GOTO function in the last cell of each column in the range, so when the command macro is running it jumps from the bottom of one column to the top of the next.

Recording International Macros You can record a macro so it will run in another language version of Microsoft Excel. For example, using the German version of Microsoft Excel, you can record a macro that will run when the macro sheet is opened in the French version of Microsoft Excel.

To record an international macro, open a new, blank macro sheet. Then choose the File Save As command, click the Options button, and then select the Int'l Macro option from the list of file types in the File Format box. After saving the macro sheet, use the Macro Set Recorder command to specify a recorder range on the new macro sheet. All subsequent macros recorded on this macro sheet will be international macros.

MORE ABOUT

For information on international macros, see "Creating an International Macro Sheet" in Chapter 20.

Tips

Document Your Command Macro Be sure to document your command macro once you have finished recording it. Documenting a command macro makes it easier for others to use, and easier for you to edit in the future. For information on documenting command macros, see "Documenting a Command Macro" in Chapter 19.

Writing a Command Macro You can also enter the formulas of a command macro directly into a macro sheet without recording. For information on entering command macro formulas yourself, see "Writing a Command Macro" in Chapter 19.

Assigning Shortcut Keys to Command Macros When assigning shortcut keys to command macros, remember that you have only 52 shortcut keys, a through z and A through Z. Assign shortcut keys to the command macros that you use frequently.

Conflicting Macro Names and Shortcut Key If you have two macro sheets with the same shortcut key assignments, Microsoft Excel runs the command macro from the macro sheet whose name appears first in alphabetic order. When assigning shortcut keys, be sure to avoid conflict with other macro sheets you use. For example, if your department uses a standard set of command macros that all have lowercase shortcut keys, you may want to assign uppercase shortcut keys to any command macros you create for yourself.

Changing the Type of Reference Recorded When recording references as part of a command macro, Microsoft Excel normally uses absolute references. However, you may want your command macro to use relative references. You can make Microsoft Excel record using relative references by choosing the Macro Relative Record command. When you choose this command, it changes to Macro Absolute Record, so you can change back to recording absolute references. You can switch between Relative Record and Absolute Record any time you want, even in the middle of recording a command macro, by choosing Macro Relative Record or Macro Absolute Record.

Assigning a Command Macro to a Button or Other Graphic Object You can assign a command macro to a button or any other graphic object you place on a worksheet. For information on assigning a command macro to a graphic object, see "Assigning a Command Macro to a Button or Other Graphic Object," later in this chapter. For information on working with graphic objects, see Chapter 14, "Using Graphics on Microsoft Excel Worksheets."

MORE ABOUT

Troubleshooting

Recorder Range Out of Room If the command macro being recorded reaches the end of the recorder range, Microsoft Excel stops recording and displays a message saying the recorder range is full. When the range is full, the recorder doesn't have any place to put the RETURN function, so it is left out. If you want to use the command macro as it exists at this point, make sure you add a RETURN function. If you run the command macro without adding a RETURN function, the macro will continue running down the current column until it reaches a RETURN function, HALT function, or the end of the column.

To extend the recorder range, either set a new recorder range that includes the old recorder range but extends beyond it, or set a new recorder range that is completely separate from the old recorder range and add at the end of the old recorder range a GOTO function that goes to the start of the new recorder range.

Running a Command Macro

You can run any command macro with the Macro Run command. Your command macro could be a short one you recorded for formatting charts, or a longer one that is part of a Microsoft Excel application your organization uses.

Online Help also provides information on running a command macro. To display online Help, choose the Window Help command. If you are using system software version 7.0 and the Help command does not appear on the Window menu, display Help by pointing to the Help menu icon and choosing the Microsoft Excel Help command. For information on a specific command, select the Commands topic. For information on using online Help, see "Using Help" in Chapter 1.

Running a command macro

Before running a command macro, make sure the macro sheet containing the macro is open.

1 Choose Macro Run.

2 In the Run box, select the name of the command macro you want to run.

You can also enter in the Reference box the reference of the first cell of the command macro you want to run.

3 Choose OK.

You can also run a command macro by holding down COMMAND and OPTION and pressing the shortcut key defined for the macro.

Stopping a command macro while it is running

1 Press COMMAND+PERIOD.

A dialog box appears asking if you want to halt the macro, step through the macro, continue running the macro, or go to the cell where the macro was stopped.

2 Choose the Halt button.

MORE ABOUT

More About Running a Command Macro

Tips

Placing a Command Macro on a Menu You can put command macros on their own menus. For information on making your own menus and dialog boxes, see Chapter 20, "Creating a Custom Application."

Stepping Through a Command Macro If you are testing a new command macro, or your macro is not performing the right actions, try starting the macro by choosing the Step button in the Macro Run dialog box. This displays a dialog box from which you can run the command macro one formula at a time. To calculate each formula, choose the Step button. To see how Microsoft Excel calculates the formula, choose the Evaluate button.

Running a Command Macro Automatically You can create command macros that run automatically whenever you open or close a worksheet. For information, see "Creating a Macro That Runs Automatically" in Chapter 20.

Running a Command Macro by Clicking a Button or Other Graphic Object You can make it easy to run a command macro associated with a specific worksheet by assigning that macro to a button or other graphic object on the worksheet. Then, to run the command macro, you just click the graphic object. For information on assigning a command macro to a graphic object, see "Assigning a Command Macro to a Button or Other Graphic Object," later in this chapter.

Troubleshooting

Command Macro Not Appearing in Macro Run Dialog Box If after opening a macro sheet you do not see the command macro you want in the Macro Run dialog box, make sure that you have the right macro sheet open, and that the command macro was named using the Command option in the Formula Define Name dialog box. If the Function option was used rather than the Command option, Microsoft Excel considers the macro to be a custom function and lists it at the end of the list of built-in functions in the Formula Paste Function dialog box.

Editing a Command Macro

After you have created a command macro, you may want to edit it. You can edit the formulas in a command macro just as you edit formulas on a worksheet. It is usually easier to make minor changes to the formulas on a macro sheet than to erase the command macro and record a new one. All the editing and formatting techniques for worksheets work on macro sheets also. For information on the worksheet and macro functions and their arguments, see the *Microsoft Excel Function Reference*.

Editing a command macro

1. Open the macro sheet containing the command macro you want to edit.
2. Edit the formulas in the command macro.
3. Save the macro sheet.

MORE ABOUT

More About Editing a Command Macro

Tips

Save Your Command Macros Before Editing If you are editing a command macro to experiment with different functions and arguments, be sure to save a copy of the original macro before you start editing.

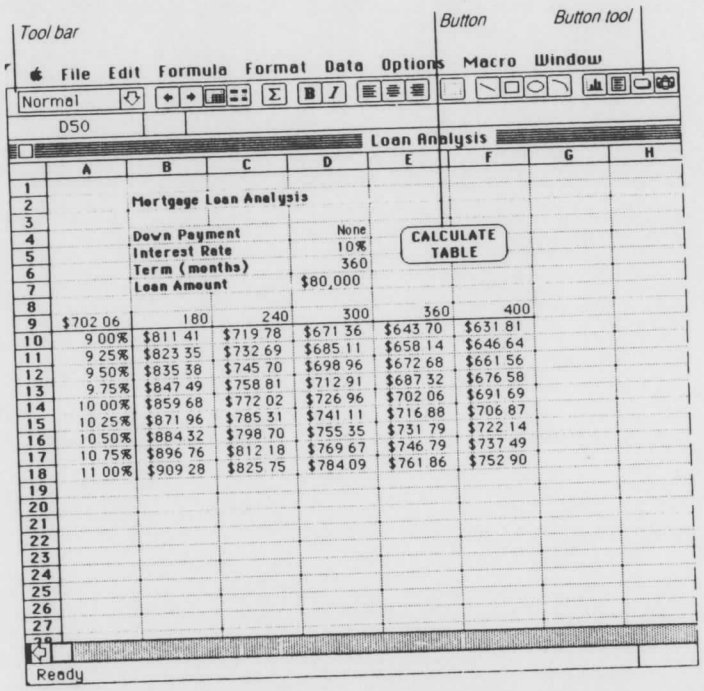
Information on Functions The *Microsoft Excel Function Reference* contains information on all Microsoft Excel worksheet and macro functions.

Assigning a Command Macro to a Button or Other Graphic Object

When you have a command macro you use with a specific worksheet or macro sheet, you can assign that macro to a button or other graphic object you place on the worksheet or macro sheet. Assigning a command macro to an object makes the macro easier to use and more visible to those who will use it. For example, adding a Print button to a summary worksheet makes it clear to those reading the summary worksheet how they can print it. To run a command macro assigned to an object, you just click the object. When the mouse pointer is positioned over an object that has a macro assigned to it, the pointer shape changes to a hand.

To add a button to a worksheet or macro sheet, you use the button tool on the tool bar. The button tool creates a graphic object that looks like a dialog box button. You can type any text you want in a button and you can format the font and alignment of the button text.

The following illustration shows the button tool in the tool bar, and a button on a worksheet:



Like any graphic object, buttons can be positioned and sized. However, you cannot format the button itself because it is already formatted to look like a dialog box button.

For information on	See
Positioning and sizing buttons	"Working with and Formatting Graphic Objects" in Chapter 14
Adding lines and shapes to a document	"Drawing Lines and Shapes" in Chapter 14
Adding pictures to a document	"Combining Charts, Worksheets, and Macro Sheets" and "Exchanging Graphics with Other Applications" in Chapter 14.

Online Help also provides information on assigning a command macro to a button or other graphic object. To display online Help, choose the Window Help command. If you are using system software version 7.0 and the Help command does not appear on the Window menu, display Help by pointing to the Help menu icon and choosing the Microsoft Excel Help command. For information on a specific command, select the Commands topic. For information on using online Help, see "Using Help" in Chapter 1.

Creating a button and assigning a command macro to it

The macro sheet containing the command macro you want to assign should be open before you do this procedure.

1. Click the button tool on the tool bar.
2. Point to where you want one corner of the button located.
3. If you want to draw a square button, hold down SHIFT.

   Or, if you want to align the button to the cell grid, hold down COMMAND.
4. Drag until the button is the size and shape you want.

   When you release the mouse button, Microsoft Excel automatically enters the text "Button" followed by a number in the button, and displays the Assign To Object dialog box.
5. In the Assign Macro box, select the command macro you want to assign to the button or type a macro name or cell reference in the Reference box.

   Only the command macros on the open macro sheets are listed in the Assign Macro box. If the command macro you want to assign is not listed, type the full reference to the macro in the Reference box, or cancel the dialog box and open the macro sheet containing the macro you want to assign to the button.
6. Choose OK.
7. Type the text you want to appear in the button.

Assigning a command macro to an existing graphic object

You can assign a command macro to any graphic object, such as a rectangle or picture you have placed on a worksheet or macro sheet. The macro sheet containing the command macro you want to assign should be open before you do this procedure.

To do this procedure, you must be using full menus.

1. Click the graphic object.
2. Choose Macro Assign To Object.
3. In the Assign Macro box, select the name of the command macro you want to assign to the object, or type a macro name or cell reference in the Reference box.

   Only the command macros on the open macro sheets are listed in the Assign Macro box. If the command macro you want to assign is not listed, type the full reference to the macro in the Reference box, or cancel the dialog box and open the macro sheet containing the macro you want to assign to the button.
4. Choose OK.

Changing the command macro assignment

You can change which command macro is assigned to a button or other graphic object at any time. The macro sheet containing the command macro you want to assign should be open before you do this procedure.

To do this procedure, you must be using full menus.

1. Hold down COMMAND and click the button or other graphic object whose assignment you want to change.
2. Choose Macro Assign To Object.
3. In the Assign Macro box, select the name of the command macro you want to assign to the object, or type a macro name or cell reference in the Reference box.

   Only the command macros on the open macro sheets are listed in the Assign Macro box. If the command macro you want to assign is not listed, type the full reference to the macro in the Reference box, or cancel the dialog box and open the macro sheet containing the macro you want to assign to the button.
4. Choose OK.

Formatting the button text font

You can change the font, size, style, and color of text in a button. Unlike formatting text in a worksheet or macro sheet cell, you can format characters separately rather than using only one format for the entire entry. You can change the format as you are typing, or you can select characters and format them after entering the text.

1. Hold down COMMAND and click the button.
2. To format some of the text, select the characters you want to format.

   To format all of the text, do not select any characters.

   To type characters in a different format, position the insertion point where you want to change formatting and click. Any characters you type following the insertion point will use the format you choose.
3. Choose Format Font.

   If you want only to change whether the text is bold or italic, you can click the bold or italic buttons in the tool bar instead of choosing the Format Font command.

4 In the Font box, select the font you want. Under Sample, Microsoft Excel shows you what the new formatting will look like.

   If the font you want is not listed, type the font name in the box below the Font box.

5 In the Size box, select the font size you want.

   If the size you want is not listed, type the size in the box below the Size box.

6 Under Style, turn on or turn off the check boxes to set the styles as you want them.

7 In the Color box, select a color.

   To set the color to the system font color, select the Automatic option.

8 Choose OK.

Formatting the button text alignment

You can change the horizontal and vertical alignment of text in a button, as well as rotate the text to a vertical orientation. You can also choose whether the button automatically changes size to fit the text or stays the same size until you change it.

1 Hold down COMMAND and click the button.

2 Choose the Format Text command.

3 Under Horizontal, select the horizontal alignment you want.

4 Under Vertical, select the vertical alignment you want.

5 Under Orientation, select the text orientation you want.

6 If you want the button size to adjust automatically to fit the text, turn on the Automatic Size check box. Once you size the button yourself, Automatic Size is turned off.

   If you want the button size to remain fixed until you change it, turn off the Automatic Size check box.

7 Choose OK.

MORE ABOUT

More About Assigning a Macro to a Button or Other Graphic Object

Tips

Running a Command Macro Assigned to a Graphic Object from the Keyboard You can run a command macro assigned to a button or other graphic object by pressing the shortcut key for the macro. To make it easy to run the command macro from the keyboard, insert the shortcut keys for a command macro as text in a button.

Assigning a Command Macro to an Invisible Graphic Object You can assign a command macro to any graphic object other than a button and then format the object with the None option under Border and under Fill in the Format Patterns dialog box. You can then place the invisible object over parts of a worksheet or macro sheet so that, whenever a user clicks the part of the macro sheet containing the invisible object, the command macro associated with the object runs.

Selecting Multiple Graphic Objects Quickly You can select more than one object at the same time using the selection tool on the tool bar. Also, when you use the selection tool, you don't have to hold down COMMAND to select objects with command macros assigned to them. For information about using the selection tool, see "Working with and Formatting Graphic Objects" in Chapter 14.

Opening Macro Sheets Automatically If you want macro sheets to open automatically when you open a document that contains buttons or objects with macros assigned to them, use an auto-open macro. For more information, see "Creating a Macro That Runs Automatically" in Chapter 20.

Troubleshooting

Overlapping Graphic Objects with Assigned Command Macros Do not overlap graphic objects assigned to different command macros. If you do, only the command macro assigned to the top object runs when you click the overlapped area.

Command Macro Not Found If the command macro assigned to a graphic object cannot be found, Microsoft Excel displays a message instead of running the command macro. To run the command macro, first open the macro sheet containing the command macro assigned to that object.

No Command Macro Assigned to Button If you click a button that has no command macro associated with it, the button is selected like any other graphic object and no command macro runs.

Designing and Writing a Command Macro

You can design and write command macros to perform routine, repetitive tasks. Your macros can start other macros, make decisions, and perform actions or calculations. Microsoft Excel includes many ways to test the macros you create. Before you read this chapter, you should be familiar with the concepts and procedures discussed in Chapter 18.

You may find it useful to look at the macros in the Add-in Functions, Slide Show, and Structured Macro Template macro sheets that come with Microsoft Excel. They include comments that will help you understand their structure. The macro sheets are stored in the Library folder in the folder that contains Microsoft Excel. For information on opening the add-in macro sheets (Add-in Functions and Slide Show) as regular macro sheets so you can view them, see "Creating Add-in Functions and Command Macros" in Chapter 20.

NOTE Unless otherwise noted, you edit, format, and print macro sheets using the same procedures you use for worksheets.

Table of Contents

Designing a Command Macro ... 591
Writing a Command Macro ... 594
Making a Command Macro Respond to Varying Conditions ... 597
Using References and Data Types in a Command Macro ... 604
Documenting a Command Macro ... 608
Testing a Command Macro ... 609
Speeding Up or Slowing Down a Command Macro ... 613

Designing a Command Macro

Before you write a command macro, you should plan it carefully. First of all, decide whether a macro can accomplish the task at hand. Following are some of the things for which macros can be useful:

- **Automate routine tasks** If you have a repetitive spreadsheet or charting task, you can increase your accuracy and efficiency by creating a macro to perform the task for you. For example, use macros to create and print weekly or monthly reports.
- **Simplify a complex worksheet** If you are working with a very large worksheet, or a worksheet that takes a long time to calculate, you can use macros to simplify your worksheet.

- **Create custom menus, dialog boxes, and buttons** You can create Microsoft Excel applications to perform specialized tasks. You may want to write a special application for people who don't know much about worksheets, for example, but who could save you time if they could enter or extract their own data using Microsoft Excel macros. For information on creating applications, see Chapter 20, "Creating a Custom Application."
- **Run other applications** You can use macros to run other applications, and to move data between Microsoft Excel and other applications. For more information, see "Linking Documents" and "Using Dynamic Data Exchange (DDE) in Command Macros" in Chapter 8.

For example, if you have two databases on a single worksheet, the following command macro makes it easy to quickly change the defined database range from one database to the other:

	A	B	C
1	*Names*	*Formulas*	*Comments*
2			
3		SwitchDatabases	Switch between two databases
4	DatabaseNow	=GET.NAME("!Database")	Get reference of DatabaseNow
5	Database1	=GET.NAME("!Database1")	Get reference of Database1
6	Database2	=GET.NAME("!Database2")	Get reference of Database2
7		=IF(DatabaseNow=Database2)	Compare references
8		= SELECT(!Database1)	If DbNow=Db2, select Db1
9		= SET.DATABASE()	Set database to selection
10		=ELSE()	
11		= SELECT(!Database2)	If DbNow=Db1, select Db2
12		= SET.DATABASE()	Set database to selection
13		=END.IF()	End if statements
14		=IF(DatabaseNow=Database2,ALERT("Database is Database1",2),)	Display current database
15		=IF(DatabaseNow=Database1,ALERT("Database is Database2",2),)	
16		=RETURN()	End macro
17			
18			

Deciding the Command Macro's Audience and Intent

You should first determine who you are writing the command macro for. Knowing who will use the macro helps you decide how to ask for input from the user, what type of error checking to include, and how extensively you need to document your macro.

Write down your assumptions about who will use the command macro and what purpose you want it to fulfill. This helps you focus on exactly what you want the macro to do.

When you have a clear idea of the command macro's purpose and audience, write one sentence or statement for each step in the macro, such as:

- Open file
- Select print area
- Choose File Print command

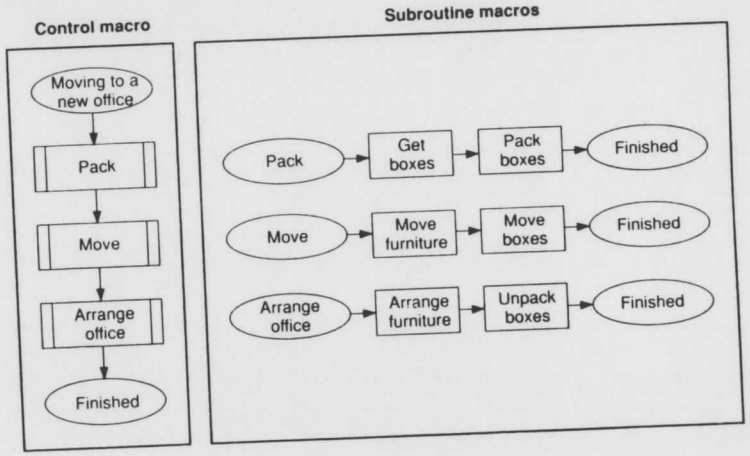
This helps you plan your command macro. It also provides good documentation for your macro once it's written.

Planning the Structure of a Command Macro

Creating a chart or diagram of the processes involved in your command macro makes it easier for you to see how your macro needs to be written.

When writing a command macro, it's a good idea to create a *control macro* and *subroutine macros*. The control macro contains the steps for the task as a whole, while each subroutine macro focuses on a specific step of the task. Keep the subroutine macros short. Shorter macros are easier to write, fix, modify, and reuse.

For example, if you were to plan moving your office as you would plan a macro, you could create one control macro and three subroutine macros, as shown in the following illustration:



With this design, you could easily add a fourth subroutine to install new carpeting.

You should also develop a plan for naming your command macros and assigning them shortcut keys. Names help users understand which macro to use. Shortcut keys assigned to frequently used macros make your macros easier to use.

Planning for Errors in a Command Macro

It's important to anticipate errors in user input and in values used by the command macro when it runs. You should write the macro so it checks for and can deal with likely errors that may occur. Planning for errors in advance helps you avoid errors while your macros are running.

For example, here are some common errors to check for:

- Invalid data encountered on a worksheet
- Invalid data entered in a dialog box
- Choosing Cancel in a dialog box

If you want your command macros to run smoothly, make sure you check for error values or FALSE values returned by functions on your macro sheet. Also, be sure to have each macro check the results from its subroutine macros.

Normally, when a command macro encounters an error, Microsoft Excel displays a dialog box in which you can choose to halt the macro, examine the macro one step at a time, ignore the error and continue the macro, or go to the cell in which the error occurred. You can use the ERROR macro function to customize this process, specifying that whenever an error is encountered, another macro starts. By writing such an error-handling macro, you can set up a process to handle errors that is designed especially for the errors you are likely to encounter.

For more information on error-checking, see the IF, ERROR, and IS functions in the *Microsoft Excel Function Reference*. In command macros that require data to be entered, dialog boxes can help you check for the correct data type. For more information, see "Creating a Custom Dialog Box" in Chapter 20.

Writing a Command Macro

Once you have designed your command macro and determined how it will run, you can start writing it. You write a macro by entering formulas in cells on a macro sheet. These formulas tell Microsoft Excel how to perform each step of the macro. Then, before running a macro that you write, you must name it as a command macro with the Formula Define Name command. For information on the worksheet and macro functions and their arguments, see the *Microsoft Excel Function Reference*. For information on macro sheets, see "Creating and Opening a Macro Sheet" in Chapter 18.

When you write a command macro, you do the following:

- Write the macro on a new or existing macro sheet using Microsoft Excel worksheet functions and macro functions
- Name the macro as a command macro using the Formula Define Name command
- Test the macro and correct any problems

Creating a new macro sheet

1. Choose File New.
2. Select the Macro Sheet option.
3. Choose OK.

Opening an existing macro sheet

1. Choose File Open.
2. Select the macro sheet you want to open.

   If the macro sheet you want to open is not listed, switch to the folder containing the macro sheet by double-clicking the folder name in the list. For more information on changing drives and folders, see "Opening an Existing Worksheet" in Chapter 3.
3. Choose the Open button.

Naming a command macro

You can name your command macro before or after you write it. By naming your macro before you write it, you can move to other parts of the macro sheet while you are writing and then quickly return to your macro by choosing the Formula Goto command and selecting the macro name.

1. Select the first cell of the macro.
2. Choose Formula Define Name.
3. In the Name box, type a name for the macro.

   The name must be a valid Microsoft Excel name, starting with a letter and consisting only of letters, numbers, periods (.), and underlines(_).
4. Select the Command option.

   If you want to specify a shortcut key for running the macro, type a letter in the Option+Command Key box. Both uppercase and lowercase shortcut keys are valid and are recognized by Microsoft Excel as different keys. You can, for example, assign the shortcut key "a" to one macro and "A" to another.
5. Choose OK.

You can now run your macro by either selecting it in the Macro Run dialog box or by pressing the shortcut key for the macro. For information on how to run a macro, see "Running a Command Macro" in Chapter 18.

MORE ABOUT

More About Writing a Command Macro

Guidelines

Descriptions of Functions All the functions and their arguments, along with examples and explanations, are listed in the *Microsoft Excel Function Reference*.

Command Macros Ignore Blank Cells In Microsoft Excel, command macros ignore blank cells, unlike in Lotus 1-2-3, where macros stop when they reach a blank line. To stop a Microsoft Excel macro, use the RETURN and HALT functions.

Tips

Paste Functions Save time, avoid misspellings, and ensure matching parentheses by using the Formula Paste Function command to paste functions into your macro formulas.

Use Names with Command Macros As much as possible, you should use names in your command macros instead of references. Names ensure that functions always refer to the correct cells or values. For information on using names in macros, see "Designing a Custom Application" in Chapter 20.

You should also name your command macros, even though you don't have to name them to use them. (To use a macro that is not named, just substitute the reference of the first cell of the macro for the name of the macro.) Naming your macros has several advantages:

- Macros are listed by name in the Macro Run dialog box.
- Shortcut keys can be assigned to named macros.
- Named macros are easier to identify.

Recording Part of a Command Macro Recording part of a command macro and then editing it is often faster than writing the macro from scratch. Recording saves you typing time, and you don't need to look up the name and syntax of every macro function you want to use. For information on setting the macro recorder range and recording macros, see "Recording a Command Macro" in Chapter 18.

Creating Dialog Boxes for Command Macros If you create dialog boxes for your command macro, the macro can ask for information from the person using the macro. This can make the macro easier to use and useful in a wider variety of situations. For information on creating a dialog box, see "Creating a Custom Dialog Box" in Chapter 20.

Making a Command Macro Respond to Varying Conditions

You can set up your command macro to:

- Take different actions depending on the values it encounters while it runs. This is called *branching*.
- Repeat an action until a certain condition is met. This is called *looping*.
- Ask for input from the user.
- Start other macros.

Branching

With branching, you can tell your command macro which task to perform, depending on a certain value. Your macro can decide whether or not to perform an action, such as "if salary is greater than $30,000, send offer; otherwise, do not send offer." Your macro can also decide between multiple actions, such as "if salary is less than $25,000, send offer A; if salary is between $25,000 and $35,000, send offer B; otherwise, send offer C." Branching is also used for handling errors.

You can jump to another command macro by using the GOTO macro function to redirect the macro to a particular macro or cell. For example, the formula =GOTO(Disburse) redirects the macro to the cell named Disburse on the current macro sheet, where it will start the Disburse macro.

To make a command macro branch between different macros or parts of one macro, depending on an existing condition, you combine the GOTO function with the IF function. The IF function has the following syntax:

=IF(*logical_test,value_if_true,value_if_false*)

To branch to another macro or part of a macro, use GOTO functions in place of values in *value_if_true* and *value_if_false*. The IF function tests a condition and then branches to the macro or part of the macro specified in one of the GOTO functions, depending on whether the test is TRUE or FALSE.

For example, suppose you're writing a command macro to update your database, and you want to delete the name of anyone who hasn't made a purchase in the last year. You might write a subroutine macro that deletes records and name it Delete. The following IF function starts the Delete macro if a customer's last purchase was made over one year ago:

=IF(last_purchase<NOW()-365,Delete())

You can also use the IF function as a block of functions, in addition to a single-line function. The block IF function has the following structure:

Function	Description
IF(*logical_test*)	Functions to perform if *logical_test* is true
ELSE()	Functions to perform if *logical_test* is false
END.IF()	Ends the block IF function

You can also use the ELSE.IF function to include additional tests in your block IF statement. For information on the IF function, see the *Microsoft Excel Function Reference*.

Looping

Use looping if you want your command macro to repeat a task or calculation. You make a macro repeat a task or calculation using a FOR-NEXT loop or a FOR.CELL loop. You make a macro repeat a task or calculation while a certain condition exists using a WHILE-NEXT loop.

- **The FOR-NEXT loop** To start a FOR-NEXT loop, you use the FOR function to set the following values:

Value	Description
Counter_text	A name that counts the number of times the loop has run
Start_num	The initial value assigned to *counter_text*
End_num	The *counter_text* value beyond which the loop stops
Step_num	A value that is added to *counter_text* each time the loop is repeated (default value is 1)

The FOR function has the following syntax:

=FOR(*counter_text,start_num,end_num,step_num*)

In the cells below the FOR function, you put the formulas and functions for the tasks or calculations that you want the loop to perform. After the tasks or calculations, you place the NEXT function. This function tells Microsoft Excel to start the loop again.

For example, the following command macro prompts you to type a word or phrase, then enters the character code equivalent for each letter in the word or phrase in successive cells:

	A	B	C
1	*Names*	*Formulas*	*Comments*
2			
3		Codes	Displays character codes of text
4	Text	=INPUT("Enter your text",2)	Prompt for text
5		=FOR("Counter",1,LEN(Text))	Loop once for each character in text
6	Code	= CODE(MID(Text,Counter,1))	Determine code of current character
7		= FORMULA(Code)	Place code in active cell
8		= SELECT(OFFSET(ACTIVE CELL(),0,1))	Select next cell in row
9		=NEXT()	Return to start of loop
10		=RETURN()	End macro
11			
12			

To make your macros easier to read, you can indent the formulas within a loop or IF-ELSE block by inserting spaces between the equal sign and the start of the formula.

A FOR-NEXT loop runs until *counter_text* reaches the stop value or the command macro encounters the BREAK function. Be sure to design your FOR-NEXT loop so that the counter eventually reaches the stop value or the loop eventually encounters a BREAK function.

For information on the FOR function, see the *Microsoft Excel Function Reference*.

- **The FOR.CELL-NEXT loop** The FOR.CELL-NEXT loop performs a function or functions for every cell in a reference you specify. Using the FOR.CELL function is much easier than writing nested FOR-NEXT loops to move through and change cells.

To start a FOR.CELL loop, you use the FOR.CELL function to set the following values:

Value	Description
Ref_name	A name that contains the reference of the cell currently being operated on by the function in the loop
Area_ref	The reference to the range you want the functions in the loop to operate on (default is current selection)
Skip_blanks	A logical value that tells Microsoft Excel whether it should skip over blank cells in *area_ref* (default value is FALSE)

The FOR.CELL function has the following syntax:

=FOR.CELL(*ref_name, area_refskip_blanks*)

After the tasks or calculations you want your FOR.CELL-NEXT loop to perform, you place the NEXT function to tell Microsoft Excel to start the loop again. When Microsoft Excel has completed the loop once for each cell in the reference you specified, or has encountered a Break function, the loop ends.

For example, suppose you have been told to reduce your department's budget by 3 percent. You could use the following command macro to enter a formula, in all the cells in the currently selected area, that would multiply the cells' contents by 0.97, effectively reducing the budget amounts by 3 percent:

	A	B	C
1	*Names*	*Formulas*	*Comments*
2			
3		**Reduce**	Reduce budget by 3%
4		=FOR.CELL("Cell_ref",,)	Start loop through current selection
5		= FORMULA(Cell_ref*0.97,Cell_ref)	Replace old formula with 3% reduction
6		=NEXT()	Go to start of loop again
7		=RETURN()	End macro
8			
9			

For information on the FOR.CELL function, see the *Microsoft Excel Function Reference*.

- **The WHILE-NEXT loop** In a WHILE-NEXT loop, you use the WHILE function to set a condition; while the condition is TRUE, the loop continues running. If the condition is FALSE the first time the macro reaches WHILE, the loop never starts.

  You can also stop a WHILE-NEXT loop with the BREAK function. Be sure to design your WHILE-NEXT loop so that its test condition eventually becomes FALSE or it eventually encounters a BREAK function.

  The WHILE function has the following syntax:

  =WHILE(*logical_test*)

  In the cells below the WHILE function, you put the formulas and functions for the tasks or calculations that you want the loop to perform. After the tasks or calculations, you place the NEXT function. This function tells Microsoft Excel to start the loop again.

  To set the test condition in the WHILE-NEXT loop, you can use the SET.VALUE and SET.NAME functions. For information on these functions, see the *Microsoft Excel Function Reference*.

The following illustration shows a fragment of a macro that calculates a series of averages from data on a worksheet, and enters the results of those averages in cells on the worksheet. It continues looping until it reaches a cell containing non-numeric data:

	A	B	C
1	*Names*	*Formulas*	*Comments*
2			
3		**RunningAverage**	Averages last 10 numbers
4		=IF(ISERROR(OFFSET(ACTIVE.CELL(),-9,-1)))	Check for proper selection
5		= ALERT("Before starting, select the cell to the right of 10th value in column",2)	Error message
6		= GOTO(End)	End macro
7		=END.IF()	End branch
8		=WHILE(ISNUMBER(OFFSET(ACTIVE.CELL(),0,-1)))	Check for end of list
9		= SELECT(OFFSET(ACTIVE.CELL(),1,0))	Select cell to hold average
10	Ave	= AVERAGE(OFFSET(ACTIVE.CELL(),-10,-1):OFFSET(ACTIVE.CELL(),-1,-1))	Compute average
11		= FORMULA(Ave)	Place average in cell
12		=NEXT()	Restart loop
13	End	=RETURN()	End macro
14			
15			

To stop a loop before it's finished, use the BREAK function. For more information, see the *Microsoft Excel Function Reference*.

Getting User Input

You use the INPUT function to ask for input from the person using the macro.

The INPUT function has the following syntax:

=INPUT(*message_text*,*type_num*,*title_text*,*default*,*x_pos*,*y_pos*)

You set the following values with the INPUT function:

- ***Message_text*** A line of text asking the user to type a response. For example, a prompt could be "Enter the inflation rate."

  Be sure your prompts are clear and specific. If the user needs to enter a particular type of data in a particular fashion, be sure to say so in the prompt.

- ***Type_num*** The type of information the user can enter. The following table shows values used to specify data types:

Value	Data type
0	Formula
1	Number
2	Text
4	Logical
8	Reference
16	Error
64	Array

Type_num can be a combination of values. For example, if the user can give either a logical value (4) or a reference (8) as input, you would use the type number 12.

- ***Title_text*** (Optional) The title that appears in the title bar of the INPUT dialog box.
- ***Default*** (Optional) The default value for the text box in the INPUT dialog box.
- ***X_pos*** (Optional) The horizontal location of the upper-left corner of the INPUT dialog box. *X_pos* is measured in points from the lower-left corner of the workspace and can be a value between 0 and 475.
- ***Y_pos*** (Optional) The vertical location of the upper-left corner of the INPUT dialog box. *Y_pos* is measured in points from the lower-left corner of the workspace and can be a value between 0 and 300.

The INPUT function returns the data the user enters, or FALSE if the user cancels the dialog box.

If your command macro takes a long time to run, you can spread out the input requests to break up the waiting time for the macro. Or, if the macro can be left running unattended, ask for all the input at the beginning of the macro and then tell the users they can leave the macro running unattended.

For information on the INPUT function, see the *Microsoft Excel Function Reference*.

Starting One Command Macro from Another

To start one command macro from another, use the following formula:

=*name_of_macro*( )

If the command macro is on a different macro sheet, *name_of_macro* must be an external reference. For example, to start a macro named Print on a macro sheet named Utilities, you would use the following formula:

=Utilities!Print( )

If you're starting a command macro that has arguments, enter the arguments between the parentheses, and separate multiple arguments with commas. For example, if on a macro sheet named Finance you have a macro called Disburse that disburses funds to different accounts, you could start the macro from a control macro and tell it to disburse $1,750.20 to the account named Rental by using the following formula:

=Finance!Disburse(1750.20, Rental)

If you're starting a command macro that does not have arguments, be sure to include the empty parentheses, after the name of the macro. For information on specifying different data types for arguments and returned values, see "Designing a Custom Function" in Chapter 17.

MORE ABOUT

More About Making a Command Macro Respond to Varying Conditions

Guidelines

Including One Loop Within Another Placing one loop inside another is called *nesting*. If a command macro encounters a BREAK function within nested loops, only the innermost loop that includes the BREAK function is ended.

Using Add-in Command Macros Command macros can be saved as add-in macros that appear to be part of Microsoft Excel. If you want to use an add-in command macro from another macro, you run the macro by typing its name, without an external reference preceding it, into a cell. For example, if the macro Disburse has been saved on an add-in macro sheet, then to use the Disburse macro to move $1,750.20 into an account named Rental, you would type the following formula:

=Disburse(1750.20, "Rental")

Add-in macros do not appear in the Macro Run dialog box. For information on add-in macros, see "Creating Add-in Functions and Command Macros" in Chapter 20.

Using a Command Macro to Start Itself Using a command macro to start itself is called *recursion*. Recursive macros are another useful way of repeating the actions or calculations in a macro. Be sure to design your recursive macro so it eventually encounters a condition that stops it.

Tips

Keep Loops Short Often a command macro does most of its work in a loop, so the faster the loop, the faster the macro. Include in your loops only those functions that must be repeated.

Keep Command Macros Simple Here's a quick test to see if your command macros are too complicated: how easy is it to explain what each of your subroutine macros does? A subroutine macro that takes speed in miles per hour and returns speed in feet per second is probably fairly simple. But a subroutine macro that creates your customer database, updates it, generates reports from it, and produces mailing labels is trying to do too much. You're better off dividing complicated macros into pieces.

Pasting Command Macro Names You can use the Formula Paste Function command to insert the name of a command macro into a formula on a macro sheet.

Using References and Data Types in a Command Macro

When writing command macros, you often need to convert references into the values contained in the referenced cells, and data types into other data types.

NOTE As much as possible, you should use names in your macros instead of references. Names ensure that functions always refer to the correct cells or values. For information on using names in macros, see "Designing a Custom Application" in Chapter 20.

Types of References

In command macros you can use a variety of references, depending on what you are referring to. You can use either A1-style or R1C1-style references. The following table describes each type of reference:

A1 style	R1C1 style	Description
$A$1	R1C1	Absolute reference to a cell in the macro sheet containing the macro
A1	R[1]C[1]	Relative reference to a cell in the macro sheet containing the macro
!$A$1	!R1C1	Absolute reference to a cell in the active sheet
!A1	!R[1]C[1]	Relative reference to a cell in the active sheet (this reference is relative to the macro sheet cell that contains the reference, not to the active cell on the active sheet)
Name!$A$1	*Name*!R1C1	Absolute reference to a cell in the named sheet
Name!A1	*Name*!R[1]C[1]	Relative reference to a cell in the named sheet (this reference is relative to the macro sheet cell that contains the reference, not to the active cell on the active sheet)

NOTE A worksheet or another macro sheet must be active when the command macro encounters a reference preceded by an exclamation point.

Using References as Arguments

In general, reference arguments are one of the following:

- **References to the active sheet, as text** If references are given as text, they must be in R1C1 style and enclosed in quotation marks. The formula =SELECT("R[8]C[-3]"), for example, selects the cell that is eight rows down and three columns to the left of the active cell on the active sheet. If you want to select a cell relative to the active cell on the active sheet, you must use this form of reference.
- **References to the active sheet, as references** If references are given as references they must be preceded with an exclamation point (!), and must be given in the reference style currently used in your workspace: either A1 or R1C1. By default, this is A1 style. If your workspace is currently set to A1 style, the formula =SELECT(!$A$1) selects cell A1 on the active sheet.
- **References to a macro sheet** These references must be given in the style currently used in your workspace. They can be external references to other macro sheets, except when noted under the description for specific functions.

If an argument requires a certain type of value, you can specify that argument as a reference to a cell that contains the required value type. For example, if an argument should be text, you can specify the argument as a reference to a cell containing text. These arguments can be either references to a worksheet or to a macro sheet, and they must be given in the reference style currently used in your workspace.

Some macro functions, such as FORMULA, take an explicit cell reference as an argument. Other functions, such as ALIGNMENT, operate on the current selection. If you want to operate on a specific cell or cells on the active sheet with a function that operates on the current selection, first use the SELECT function to select the cells and then perform the operation.

Converting Data Types

If you use an argument that does not produce the correct data type, Microsoft Excel tries to convert the argument into the desired data type. For example, the LEN function takes one text argument and returns the number of characters in that argument. LEN("abc") equals 3. If you enter the formula =LEN(1202) in a cell, Microsoft Excel internally converts the number 1202 into the text value "1202". The formula =LEN(1202) therefore equals 4. If you have the number 1202 in cell B10, then LEN(B10) equals 4.

Microsoft Excel converts numbers, text, and logical values as follows:

Current Data Type	Data Type Needed		
	Number	Text	Logical
Number	No conversion needed	Number automatically converts to text, as if it were enclosed in quotation marks	If the number is zero, it converts to FALSE; otherwise, the number converts to TRUE
Text	If the text is in any Microsoft Excel standard date, time, or currency format, it is treated as a number	No conversion needed	If the text is "true" or "false", it converts to TRUE or FALSE; otherwise, it does not convert
Logical	TRUE converts to 1; FALSE converts to 0	TRUE converts to "TRUE"; FALSE converts to "FALSE"	No conversion needed

If you use an error value as an argument to a function that does not accept error values as arguments, the function returns another error value.

In some command macros Microsoft Excel cannot automatically convert data types for you. You will need to use functions to convert one data type into another data type. Use the following table to determine what function to use to convert data types.

Current Data Type	Data Type Needed		
	Number	Text	Logical
Number	No conversion needed	TEXT function	OR function
Text	VALUE function	No conversion needed	No applicable function
Error	No applicable function	TEXT function	No applicable function
Logical	No applicable function*	TEXT function	No conversion needed
Reference	No applicable function	REFTEXT function	No applicable function
Date	The date functions	TEXT function	No applicable function

*You can convert a logical to a number by multiplying by one.

MORE ABOUT

More About Using References and Data Types in a Command Macro

Guidelines

References Are Not Stored If you display values on a macro sheet, you may notice that references aren't stored in the cells of macro functions that return references. This is because the reference is immediately translated into the contents of the cell referred to.

Relative References for Moving the Selection In Microsoft Excel, relative references are used instead of the "directional macro keys" ({down} and {up}, for example) used in Lotus 1-2-3. To move one cell to the right, you would use the following formula:

=SELECT("RC[1]")

To move 10 cells down, use the following formula:

=SELECT("R[10]C")

Using an Array in a Command Macro Microsoft Excel uses an array in a command macro in one of three ways:

- Some worksheet functions (AND, AVERAGE, COUNT, COUNTA, MAX, MIN, OR, STDEV, STDEVP, SUM, VAR, and VARP) can take from 1 to 14 arguments. All arguments must be of the same data type. If an array is used as an argument to one of those functions, all elements of the array are used to produce a single result.
- If the formula is an array formula, the function acts on each element of the array and produces an array result. The ABS function uses a single number as an argument, and returns a positive number. The result of the array formula {=ABS({1,–2,3;–4,5,–6})} is {1,2,3;4,5,6}.
- If the formula is not an array formula and the function is not one of those listed above, the function takes the first element of the array and ignores the rest. For example, the formula =ABS({1,–2,3;–4,5,–6)} equals 1.

Tip

Using Arguments with a Command Macro Just as with a custom function, you can send values to and return values from a command macro. You do this by defining arguments and using the RETURN function. For more information, see "Designing a Custom Function" in Chapter 17.

Documenting a Command Macro

Documenting your command macros makes them easier to read and understand. Notes, comments, macro names, cell names, and formatting are all ways to document your macros.

- **Notes** Use notes with a macro sheet the same way you would with a worksheet. Notes are useful when you need explanations that are too long to write conveniently on the macro sheet. Notes are also a good way to explain how to use your macro, since anyone can look at a list of all the notes attached to a document. For information, see "Adding Comments to a Worksheet" in Chapter 6.
- **Comments** Brief explanations written in a column next to your macro are a good way to document how your macro works. Comments help you and others understand how the macro was created. This makes the macro easier to maintain after it is written. When you write comments, explain why and how your macro operates, not just what it is doing.
- **Macro names** Use a descriptive name in the first cell of your macros. When you run a macro by specifying its name, Microsoft Excel finds the named cell, calculates the formula in the cell directly below the named cell, and continues down the column. For information on naming macros, see "Writing a Command Macro," earlier in this chapter.
- **Cell names** Once you have named a cell, you can use that name anywhere in your macro to refer to that cell. Using names to identify key cells in a macro makes your macros easier to understand. For information on naming cells, see "Naming Cells and Formulas" in Chapter 6.
- **Formatting** Format your macro sheets in the same way you format your worksheets. Formatting does not affect how a macro runs. Removing gridlines and using borders and shading to emphasize certain parts of your macros can make them easier to read. It's also a good idea to use different fonts to make names, comments, and labels stand out. Using the same formatting scheme for all of your macros makes them easier to understand. For information on formatting, see Chapter 5, "Formatting a Worksheet."

MORE ABOUT

More About Documenting a Command Macro

Guidelines

Using Text on a Macro Sheet Command macros skip over cells containing text and go on to the next cell. This lets you put comments and named cells in your macro without affecting how it runs.

Aligning Formulas Alignment is not visible when you are displaying formulas instead of values, which is the default setting for macro sheets.

Testing a Command Macro

If you see that something is not working correctly with a command macro, start narrowing the possible locations of the problem. The best way to do this depends on your situation. The following sections describe a variety of methods for finding and fixing problems.

Some of the methods involve adding functions to your macro sheet to help the problem-solving process. After you have fixed the problems with your command macro, remember to remove these functions.

Online Help also provides information on testing a command macro. To display online Help, choose the Window Help command. If you are using system software version 7.0 and the Help command does not appear on the Window menu, display Help by pointing to the Help menu icon and choosing the Microsoft Excel Help command. For information on a specific command, select the Commands topic. For information on using online Help, see "Using Help" in Chapter 1.

Stepping through a command macro

Stepping through a command macro means that Microsoft Excel calculates a formula contained in one cell of your macro sheet, and then stops and displays a dialog box showing the next formula to be calculated. By stepping through a macro, you can quickly check the individual steps of a macro, and make sure that formulas are being calculated in the correct order. You cannot edit the macro as you are stepping through it.

1. Choose Macro Run.
2. In the Run box, select the macro you want to run.
3. Choose the Step button.

   Microsoft Excel displays the Step dialog box. The dialog box tells you which cell in the macro Microsoft Excel is about to calculate. You can move the dialog box if it's in your way.
4. To step through the macro, choose the Step button.

   To stop the macro, choose the Halt button.

   To resume running the macro, choose the Continue button.

   To calculate formulas one function or operator at a time, choose the Evaluate button.

Making a command macro step automatically

You can add stepping to a command macro or a section of a macro by including the STEP function in your macro. This lets you step through a macro you are testing without always having to start the macro from the Macro Run command or interrupt the macro.

1. If there's no empty cell above where you want stepping to start, insert a cell.

   Make sure that the cell is part of the group of cells you named as a macro.

2. Enter **=STEP()** in the cell where you want to start stepping.

3. Start the macro.

   Microsoft Excel runs the macro until it reaches the STEP function and then displays the Step dialog box.

Stepping through an individual formula

In addition to stepping through the formulas in a command macro, you can step through and evaluate the calculation of each part of a formula. This helps you check a formula for error values or mathematical errors.

1. Display the Step dialog box.

   You can display the Step dialog box by choosing Macro Run and then choosing the Step button or by adding the STEP function to the macro, as described in the preceding procedures.

2. Choose the Evaluate button.

   Each time you choose the Evaluate button, Microsoft Excel calculates the next part of the formula.

You can also step through an individual formula by pressing SHIFT+ENTER while the Step dialog box is displayed.

Interrupting a command macro

You can interrupt a command macro while it's running. Interrupting gives you the choice of stopping the macro, stepping through the macro, continuing the normal execution of the macro, or going to the cell at which the macro stopped.

1. Press COMMAND+PERIOD.

   Microsoft Excel displays a dialog box.

2. To stop the macro, choose the Halt button.

   To continue stepping through the macro, choose the Step button.

   To resume running the macro, choose the Continue button.

   To go to the cell where the macro stopped, choose the Goto button.

Displaying returned values on the macro sheet

You can switch a macro sheet from displaying formulas—its default—to displaying values. This helps you find erroneous values. For example, you might know that a command macro is not working correctly but you don't know where it is going wrong. Displaying values can show which formulas returned FALSE or error values. You can then correct those formulas to fix your macro.

1. Choose Options Display.
2. Turn off the Formulas check box.

To resume displaying formulas, turn the Formulas check box back on.

You can also switch between displaying values and formulas by pressing COMMAND+` (single left quotation mark).

MORE ABOUT

More About Testing a Command Macro

Guideline

Values Returned by Macro Functions Most action-taking macro functions return the value FALSE before they are run, TRUE after they run successfully, and FALSE or an error value if they don't run successfully. For information on what a specific function returns, see the *Microsoft Excel Function Reference*.

Tips

Using the Macro Debugger Microsoft Excel includes the Macro Debugger to help you find the problems in your command macros. The Macro Debugger is a Microsoft Excel macro that lets you:

- Set a breakpoint, a place where the macro pauses and Microsoft Excel displays the value of variables you have specified.
- Set a tracepoint, a place where your macro pauses and you can start stepping through it.
- Switch between displaying formulas and values on a macro sheet.
- Select error values.
- Run macros.
- Jump to references and named areas.

The Macro Debugger is stored as Macro Debugger in the Library folder in the folder containing Microsoft Excel. For information on the Macro Debugger, see Appendix B, "Microsoft Excel Library."

MORE ABOUT

Anticipate Mistakes Try to anticipate the mistakes people may make while using your command macro. For example, if your macro asks people to type the number of labels to print, test what happens if they type "twenty," or –10, or .5. Also, test what happens if someone chooses the Cancel button in one of your INPUT or custom dialog boxes.

Working with Part of a Macro In some cases, you may want to temporarily add a HALT or RETURN function before the end of your command macro. This can be useful if you want to work with just the first part of your macro, or if you're debugging a custom function and want to check a particular value.

Moving Quickly to the Formula That Is Causing an Error When you run a macro and Microsoft Excel encounters an error, a dialog box appears. To quickly jump to the cell containing the error, choose the Goto button.

Getting Help with Error Messages To get online Help on any messages, press COMMAND+SLASH(/) while the message is on your screen.

Use Copies of Your Documents to Test a Macro Use copies of your documents while testing a command macro because an untested macro may accidentally destroy part or all of a document. You should also save your macro sheet and worksheets before testing. Be especially careful about testing macros that will run automatically. After making a change to such a macro, prevent it from running automatically by deleting the macro's Auto_Close or Auto_Open name. Before letting the macro run automatically, test the macro as thoroughly as possible. For information on macros that run automatically, see "Creating a Macro That Runs Automatically" in Chapter 20.

Have Someone Check Your Command Macro Ask someone else to check your command macros to help find blatant errors, such as a misspelled function name or a GOTO function that goes to the middle of an unrelated macro. Obvious errors can be hard to see yourself. After you've been working with a macro for a while, it's natural to assume that you've already found all the obvious mistakes.

Adapt the Goal of Your Command Macro if Necessary If you find that your command macro doesn't work unless a database is already defined, you don't necessarily have to rewrite the macro so that it defines the database for you. Just make it clear in the documentation of your macro that it requires a defined database. Or, better yet, have the macro check for a defined database before it runs.

Use Test Situations Develop conditions where you know what the result of your command macro should be. Then run the macro and see if it does what you think it should. You may want to see what your macro does when given a set of test data, such as a worksheet filled with zeros or a database filled with –1's.

MORE ABOUT

Test the Limits of Your Command Macro Test the effects of going over or under any limits inherent in your command macro. For example, if you've written a macro that should print up to 100 labels, try running the macro to print 100 labels, to print 101 labels, to print 0 labels, and to print 1 label.

View Both Formulas and Values While testing your command macro, you may find it useful to view both formulas and values at the same time. You can do so by opening a second window for the macro sheet with the Window New Window command. Then set one window to display values and the other to display formulas, and arrange the windows so you can see them both.

Using a Variable Value to Start Stepping You can start stepping through a section of a command macro by combining the IF and STEP function with the variable. For example, if you want to check what happens at the end of a loop that repeats 20 times, you could put the following statement in your loop:

=IF(Counter=19,STEP( ))

When the loop executes for the 19th time, Microsoft Excel displays the Step dialog box and you can step through the loop the last time it runs.

Speeding Up or Slowing Down a Command Macro

At times you'll need to control the speed of a command macro, either to increase it for efficiency or to decrease it for displaying information.

Speeding Up a Command Macro

There are several things you can do to increase the speed or perceived speed of your command macro.

- **Turn off screen updates using the ECHO function** Turn off screen updates in sections of your macro where users do not need to see what happens on the screen. Turn screen updates back on when users need to see what is displayed on the screen. For information on the ECHO function, see the *Microsoft Excel Function Reference*.
- **Hide macro sheets** Hiding macro sheets reduces the number of screen updates Microsoft Excel must perform while running a macro, thus freeing your computer to perform other tasks. You can hide windows using the HIDE function. For information on the HIDE function, see the *Microsoft Excel Function Reference*.
- **Turn off automatic calculation** Using the CALCULATION function, you can control the type of calculation used for your worksheets: automatic, automatic except tables, or manual. Turn on manual calculation when automatic calculation is not necessary and then use the CALCULATE.NOW and CALCULATE.DOCUMENT functions to calculate worksheets when needed. For information on the various calculation functions, see the *Microsoft Excel Function Reference*.

- **Make your macro responsive** Do long tasks, such as calculating complex worksheets, when you know the user is waiting. For example, open the documents the macro needs right when the macro starts, since the user is waiting for the macro to start anyway.
- **Keep users informed of progress during long tasks** Waiting is easier when you know that progress is being made. Using the MESSAGE function, you can display progress during tasks such as opening documents, calculating, or printing. For information on the MESSAGE function, see the *Microsoft Excel Function Reference*.
- **Intersperse input with action** A series of small waits between dialog boxes seems shorter than one long wait after a series of dialog boxes. If your macro requires input from the user, intersperse the INPUT functions with the other actions. For information on the INPUT function, see the *Microsoft Excel Function Reference*.
- **Use external references instead of activating windows** For example, if you need a macro to enter a formula on a worksheet, use an external reference with the FORMULA function to enter the formula:

  =FORMULA("=Profits–Taxes","Worksheet1!R10C11")

  =RETURN()

  Using this function with an external reference saves many steps over a function that activates the worksheet, selects a cell, inserts the formula, and then reactivates the macro sheet.

Slowing Down a Command Macro

If your command macro displays information that users need to read, you may need to slow down the speed of your macro. You can use the WAIT function to make a macro wait a certain amount of time or resume running at a specific time. You can also use the ALERT function to display a message and allow the user to respond to the message. For information on the WAIT and ALERT functions, see the *Microsoft Excel Function Reference*.

Creating a Custom Application

With Microsoft Excel, you can create your own applications that include custom buttons, menus, commands, dialog boxes, and templates. Custom applications can appear to users as a separate application or as part of Microsoft Excel. You can create specialized applications, and save them as add-in macros that run automatically.

Before performing the procedures in this chapter, you should be familiar with the procedures and concepts presented in Chapter 17, "Creating and Using Custom Worksheet Functions"; Chapter 18, "Automating Tasks with Command Macros"; and Chapter 19, "Designing and Writing a Command Macro."

Table of Contents

Designing a Custom Application ... 615
Creating a Macro That Runs Automatically ... 618
Creating a Custom Dialog Box ... 620
Using a Custom Dialog Box in a Command Macro ... 628
Creating a Custom Command ... 637
Creating a Custom Menu ... 642
Creating a Custom Menu Bar ... 645
Creating a Custom Help Topic ... 646
Creating Add-in Functions and Command Macros ... 647
Using a Code Resource as a Custom Function ... 649
Creating an International Macro Sheet ... 651

Designing a Custom Application

Before you start writing a custom application, you should design it. Decide what the application will do, how it will accomplish its purpose, and who will use it. Then, design how it will be used and how you will create the macros that constitute the application.

Designing the Menus, Commands, and Dialog Boxes

Once you know what you want the application to do and who will use it, you need to design how users will use your custom application. If you first identify the tasks users will perform in using the application, you can then create one or more commands for each task users need to perform. This can include designing the reports or charts that users of the application will print.

Next, it's a good idea to draw all the menus and dialog boxes that will be needed in the application. Drawing the menus and dialog boxes helps you visualize the application as a whole before you start writing command macros, gives you something to test, and lets other people review your design before you create the application. Also, drawings can help you create the actual menus and dialog boxes.

Designing the Macros

Once you have identified the user tasks in a custom application and designed the menus, commands, and dialog boxes, you can start designing the macros that will perform the work of the application.

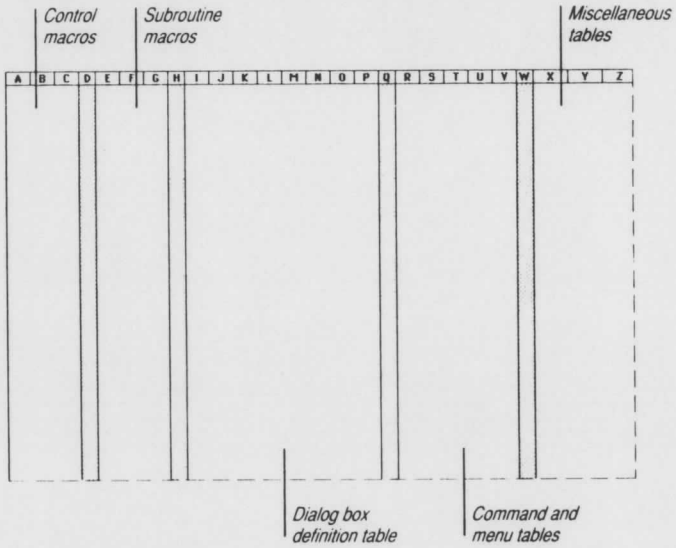
- Design your custom applications using control macros and subroutine macros, as discussed in Chapter 19, "Designing and Writing a Command Macro." Control macros usually correspond to commands in your application. Users run these macros by choosing a command from a menu or by pressing a key combination. Subroutine macros are used by the control macros to carry out commands. Create a flow chart that shows how the various macros work together.
- Design a naming system for macros and the values used with macros. A consistent naming system makes your macros easier to read and maintain. In simple applications, use the macro name to name the range containing the macro. For values within a macro, use the macro's name as a prefix to the value's name. Design your naming system so that similar names will appear next to one another in the Formula Define Name, Formula Paste Name, and Formula Goto dialog boxes.

  For example, a simple custom application might have a command called Update Report. You would use the name Update_Report to name the range containing the macro that updates the report. To name the cell that records the date the report was updated, use the name Update_Report.Date. You could then use the name Update_Report.Date in other macros in the application.

  Other types of information you might want to include in your macro naming scheme are the type of macro (control or subroutine) and the type of object to which the name refers (cell, range, formula, array, or value).

- Design the layout of the macro sheet, grouping similar items together. All control macros should be in one place, all subroutines in another place, and all dialog box descriptions in another place. Your macro sheet layout should be easy to read and understand and should permit easy insertion and deletion of rows and columns.

  The following illustration shows one way to design the layout of a macro sheet. The macro area takes up three columns: one for names, one for formulas, and one for comments. The dialog box definition table and command and menu table areas contain enough columns to store all the elements of custom dialog boxes, commands, and menus.


Control macros
Subroutine macros
Miscellaneous tables
A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
Dialog box definition table
Command and menu tables

With this layout, you can add rows to any section without disrupting the cells or tables in other sections. You can also add additional sections to the right of the command and menu table area. This layout is used throughout this book.

Creating a Macro That Runs Automatically

You can create a macro that runs automatically every time you open or close a particular document. Before you define a macro to run automatically, make sure it is thoroughly tested.

NOTE An automatic macro does not run if the document in which it is defined is itself opened or closed by a macro. In that case, include the RUN macro function in the macro that opens or closes the document. For information on the RUN function, see the *Microsoft Excel Function Reference*.

For information on	See
Recording a macro	Chapter 18, "Automating Tasks with Command Macros"
Writing and testing a macro	Chapter 19, "Designing and Writing a Command Macro"

Running a macro when opening a specific document

To have a macro run automatically when a document is opened, define a name that starts with Auto_Open and refers to the name of the macro you want to run. Then, the macro runs whenever the specified document is opened. You can have multiple names that start with Auto_Open. For example, your organization may have a macro that runs with every worksheet, such as Auto_Open_Menu. You can add your own macro that you want to run every time you open a specific worksheet. When you open that worksheet, both macros run.

1. Activate the document.
2. Choose Formula Define Name.
3. In the Name box, type a name that starts with **Auto_Open**
4. In the Refers To box, enter the name or reference of the macro you want to run.

   If you enter an external reference, Microsoft Excel opens the macro sheet (if it is not already open) before running the macro.
5. Choose OK.

Running a macro when closing a document

To have a macro run automatically when a document is closed, define a name that starts with Auto_Close and refers to the name of the macro you want to run. Then, the macro runs whenever the specified document is closed. The macro sheet containing the macro must be open for the macro to run.

1. Activate the document.
2. Choose Formula Define Name.
3. In the Name box, type a name that starts with **Auto_Close**

4. In the Refers To box, enter the name or reference of the macro you want to run.

   If you enter an external reference, Microsoft Excel opens the macro sheet (if it is not already open) before running the macro.
5. Choose OK.

MORE ABOUT

More About Creating a Macro That Runs Automatically

Guideline

Using Hidden Names with Automatic Macros With the DEFINE.NAME function, you can define a name used with automatic macros as a regular name or a hidden name. Hidden names do not appear in the list of names in the Formula Define Name, Formula Paste Name, and Formula Goto dialog boxes.

You should define an automatic macro name as one type of name or the other, but not both. If Microsoft Excel finds automatic macros with both regular and hidden names, it runs the macros with hidden names before the ones with regular names.

For information on the DEFINE.NAME function and related functions, see the *Microsoft Excel Function Reference*.

Tips

Opening Documents Automatically When Microsoft Excel Starts Combining macros that run automatically with documents that open automatically can be a convenient way to start a custom application in Microsoft Excel. You can specify a document to open automatically by placing it in a startup folder. For more information, see "Specifying a Startup Folder and Document," in Chapter 16.

Bypassing Macros That Run Automatically You can open or close a document without running an auto-open or auto-close macro by holding down SHIFT when you chose the Open button in the File Open dialog box or when you choose File Close. If a message is displayed before the file opens or closes, such as for entering a password, you must also hold down SHIFT when you choose OK in that message.

Preventing a Document from Being Closed To prevent a document from being closed, include the following function in the auto-close command macro:

=HALT(TRUE)

This function also halts the auto-close macro, so put it at the end of the command macro. You can combine this function with the IF function to prevent a document from being closed unless some action has been performed. For more information on the IF and HALT functions, see the *Microsoft Excel Function Reference*.

Event-Triggered Command Macros You can also trigger macros to run with events other than opening or closing a document. The following table lists functions that run a macro when a specific event occurs.

MORE ABOUT

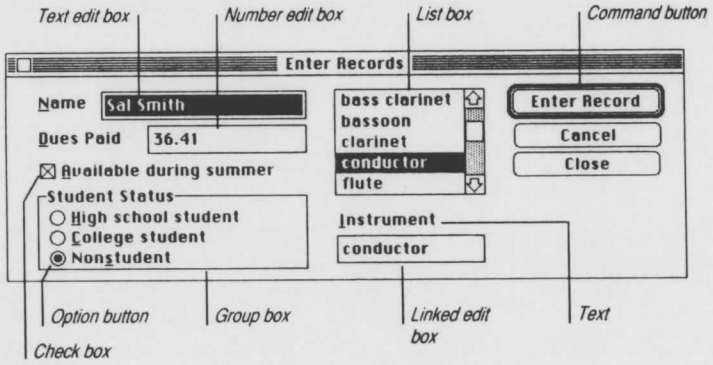
Function	Action
CANCEL.KEY	Runs a specified macro when you cancel an operation or macro
ERROR	Runs a specified macro when an error is encountered in a running macro
ON.TIME	Runs a specified macro at a specific time
ON.WINDOW	Runs a specified macro when a specified window is activated
ON.KEY	Runs a specified macro when a specified key is pressed
ON.DATA	Runs a specified macro when another application sends data to Microsoft Excel through dynamic data exchange (DDE)
ON.TIME.CALC	Runs a specified macro when a specified document is recalculated

For information on these functions, see the *Microsoft Excel Function Reference*.

Creating a Custom Dialog Box

You create a custom dialog box by using the Dialog Editor, a separate application included with Microsoft Excel. With the Dialog Editor, you can add, arrange, move, or resize items in a dialog box, and move or resize the dialog box. You can also group items to show they are related. For example, you can group several option buttons so that only one of the options can be selected at a time. Once you create a group, you can resize and move it as a unit.

You can add a variety of items to a custom dialog box.



The Dialog Editor helps you quickly create custom dialog boxes for Microsoft Excel command macros. You can create custom dialog boxes that look exactly the way you want them to. When you create a dialog box, the Dialog Editor automatically writes a *dialog box definition* that describes the dialog box and all the items it contains. The definition also includes position, width, and height coordinates and any text labels for the items contained in the dialog box.

To create and use a custom dialog box:

- Create the dialog box with the Dialog Editor.
- Copy the dialog box definition to a macro sheet.
- Write a command macro to use the dialog box.

When you run the command macro, any input is transferred automatically from the dialog box into the dialog box definition on the macro sheet. Your other macros can then refer to the values in the dialog box definition.

Creating a New Dialog Box

When you start the Dialog Editor, it automatically creates a blank dialog box.

Starting the Dialog Editor

▶ In the folder containing Microsoft Excel, double-click the Dialog Editor icon.

Once you have a dialog box on your screen, you can add, delete, and move items in the dialog box.

Adding an item to a dialog box

All items except group boxes and fixed text have more than one variation. When you choose the item you want from the Item menu, a dialog box appears so you can specify the variation you want.

▶ From the Item menu, choose the item you want to add.

To add a copy of an item, select it and press ENTER or choose Edit Duplicate.

NOTE If you select a group box and press ENTER, an option button is added to the group box.

Selecting an item in a dialog box

You must select an item before you can move, resize, or delete it.

▶ Click the item you want to select.

▶ Press TAB until the item you want is selected.

Selecting multiple items in a dialog box

1 Click the first item you want.

2 Hold down SHIFT and click the items you want to select.

Deleting an item in a dialog box

1 Select the item or items you want to delete.

2 Choose Edit Clear.

You cannot delete a dialog box with the Edit Clear command. If you choose this command when a dialog box is selected, all the items in the dialog box are deleted.

Moving an item in a dialog box

NOTE You may need to choose Edit Info and turn off the Auto check box for the x and y position before you can move the dialog box item.

▶ Drag the item to the location you want.

1 Press TAB to select the item you want.

2 Use the ARROW keys to move the selected item in the direction you want. To move the item one pixel at a time for more precise positioning, hold down OPTION and press an ARROW key.

3 When the item is where you want it, press ENTER.

Resizing an item in a dialog box

NOTE You may need to choose Edit Info and turn off the Auto check box for Height and Width before you can change the size of the dialog box item.

1 Click the item you want to resize.

2 Drag the border of the item until it's the size you want.

1 Press TAB to select the item.

2 Hold down SHIFT and press an ARROW key to change the size of the item.

3 When the item is the size you want, press ENTER.

Canceling a change

To cancel moving or sizing an item:

▶ Press COMMAND+PERIOD before you press ENTER or release the mouse button.

Turning off automatic sizing and positioning

Some of the dimensions of dialog box items, such as the height of an OK or Cancel button, cannot be changed until you turn off the Auto check box.

1 Double-click the item.

2 Turn off the Auto check box next to the dimension you want to change.

3 Type the size or position you want.

4 Choose OK.

1 Select the item.

2 Choose the Edit Info command.

3 Turn off the Auto check box next to the dimension you want to change.

4 Type the size or position you want.

5 Choose OK.

Working with a Group of Items

A group is a set of related items placed together in a group box because they share similar functionality. You can move, resize, or delete an entire group. After you create a group box, you can add items, delete items, and move items into and out of the group.

Creating a group of items in a dialog box

You create a group box before you create the items you want in it.

1 Choose the Item Group Box command.

2 From the Item menu, choose the items you want to add.

You can also add option buttons to a group by selecting the group and pressing ENTER for each option button you want to create. Immediately after creating an option button, type the name you want for the button.

Adding an existing item to a group

If you try to drag an existing item into a group box, it is not displayed if it was created before the group box was created. To display that item in the group box:

1 Select the item.

2 Choose the Edit Cut command.

3 Make sure the group box is selected.

4 Choose the Edit Paste command.

5 Drag the item into the group box, or use the ARROW keys to position the item and then press ENTER.

Changing a group of items

1 Select the group box.

2 Choose Edit Select Group.

3 Move, resize, or delete the group as you would an individual item.

You can also edit, move, resize, or delete individual items in a group box just as you do items not in group boxes.

Copying a Dialog Box to a Macro Sheet

After you create a dialog box with the Dialog Editor, you copy the resulting dialog box definition to a Microsoft Excel macro sheet.

Copying the dialog box definition to a macro sheet

To use your custom dialog box in a macro, you first copy the dialog box to a macro sheet. As soon as you copy the dialog box to the Clipboard, any other dialog box already there is deleted. It's a good idea to paste a dialog box into a macro sheet immediately after copying it to the Clipboard.

1. Choose Edit Select Dialog.

   With the mouse, you can also click the dialog box border to select the dialog box.

2. Choose Edit Copy to copy the dialog box to the Clipboard.
3. Switch to Microsoft Excel.
4. Open the macro sheet in which you want to paste the dialog box definition.
5. Select the cell in the upper-left corner of the range where you want the dialog box definition pasted.

   If you are changing an existing dialog box, the revised dialog box definition may fill more rows on the macro sheet than it did before, especially if you added items to the dialog box. You may want to first paste the dialog box definition into an empty area of the macro sheet to see how many rows it will fill. That way, you can make sure that you will not unintentionally replace other data with the additional rows.

6. Choose Edit Paste.

   Microsoft Excel pastes one row of data for each item in the dialog box and one row for the dialog box itself.

7. Name the dialog box definition by choosing Formula Define Name and typing a name in the Name box.

Quitting the Dialog Editor

After you copy the dialog box definition to a macro sheet, you can quit the Dialog Editor.

Quitting the Dialog Editor

▶ In the Dialog Editor, choose File Quit

If you created a new dialog box or changed an existing one, the Dialog Editor asks if you want to copy your changes to the Clipboard. If you want to use the dialog box in Microsoft Excel and have not already copied it, choose the Yes button. If you choose the No button, any changes made to the dialog box are lost.

Displaying a Dialog Box

To display your dialog box, you need to create a macro that uses the dialog box definition you created with the Dialog Editor. Use the DIALOG.BOX function in the macro to display a dialog box.

=DIALOG.BOX(*dialog_ref*)

The *dialog_ref* argument is the reference or name of the cell range that contains the dialog box definition table. The DIALOG.BOX function returns the item number of the button chosen to close the dialog box. If the Cancel button is chosen, the DIALOG.BOX function returns FALSE. For more information on the DIALOG.BOX function, see the *Microsoft Excel Function Reference*.

Editing an Existing Dialog Box

You can open an existing dialog box in the Dialog Editor to change it or delete it completely.

Deleting an existing dialog box

To delete all contents of the dialog box that is currently displayed in the Dialog Editor:

▶ Choose File New.

If you changed the displayed dialog box, the Dialog Editor asks if you want to copy the changes to the Clipboard. To copy the changes to the Clipboard, choose the Yes button. To lose your changes, choose the No button.

Changing an existing dialog box

You can change a custom dialog box that already exists on a macro sheet by copying the dialog box definition from the macro sheet to the Clipboard and then pasting it from the Clipboard into the Dialog Editor. You can then edit the dialog box in the Dialog Editor.

1. In your macro sheet, select the cell range containing the dialog box definition table.

   Make sure you select all the cells containing the item, position, size, text, and initial/result information. The dialog box definition table is seven columns wide and at least two rows long.

2. Choose Edit Copy.
3. Switch to the Dialog Editor.
4. In the Dialog Editor, choose Edit Paste.
5. Add, delete, move, or resize the items you want.
6. Choose Edit Select Dialog.

   With the mouse, you can also click the dialog box border to select the dialog box.

7 Choose Edit Copy to copy the revised dialog box to the Clipboard.

8 Switch to Microsoft Excel.

9 In the macro sheet, select the cell in the upper-left corner of the range containing the dialog box definition.

The revised dialog box definition may fill more rows on the macro sheet than it did before, especially if you added items to the dialog box. You may want to first paste the dialog box definition into an empty area of the macro sheet to see how many rows it will fill. That way, you can make sure that you will not unintentionally replace other data with the additional rows.

10 Choose Edit Paste.

Changing the location of a dialog box

A custom dialog box always appears on the screen in the same location as when it was copied to the macro sheet. If you want to change the location of a custom dialog box on your screen, reposition it in the Dialog Editor.

NOTE You may need to choose Edit Info and turn off the Auto check box for the x and y position before you can change the location of the dialog box.

1 Click the border of the dialog box to select the entire dialog box.

2 Drag the dialog box to the location you want.

All the items in the dialog box move along with it.

1 Choose Edit Select Dialog.

2 Use the ARROW keys to move the dialog box to the location you want.

Resizing a dialog box

NOTE You may need to choose Edit Info and turn off the Auto check box for Height and Width before you can change the size of the dialog box.

1 Click the border of the dialog box to select the entire dialog box.

2 Drag a side or corner of the dialog box until it is the size you want.

1 Choose Edit Select Dialog.

2 Hold down SHIFT and press an ARROW key to change the size of the dialog box.

3 When the dialog box is the size you want, press ENTER.

MORE ABOUT

More About Creating a Custom Dialog Box

Guidelines

Number of Items in a Dialog Box A single custom dialog box can include:

- 62 items
- 32 items that can take or return arguments
- 4 list boxes
- 1,024 text characters

Measuring Position of Dialog Box Items The horizontal position of an item within the dialog box is measured in from the left edge of the dialog box to the left edge of the item. The vertical position of an item is measured in from the top of the dialog box to the top of the item.

Number Formats in Custom Dialog Boxes Number formats appear only in fixed text, integer edit boxes, and number edit boxes (item numbers 5, 7, and 8). For number formats to be displayed in other parts of a custom dialog box, the numbers must be entered as text.

Tips

Moving or Sizing Items in a Single Direction If you hold down SHIFT while you drag an item or its border, you will be able to drag only vertically or horizontally, depending on which direction you first move the mouse.

Aligning Dialog Box Items You can use the Edit Info dialog box to precisely size and position a dialog box item. For example, you can align a series of edit boxes by typing the same x coordinate for each of them.

Some items have the Auto check box turned on for one or more of the four size and position coordinates. You cannot change the width or height of an item while the Auto check box is turned on for that dimension. To change the size of the item, first turn off the Auto check box and then type a new number in the associated edit box.

Getting Information on a Custom Dialog Box For information on a dialog box you are creating with the Dialog Editor, select the dialog box and choose the Edit Info command. The Info dialog box appears, showing the size and position coordinates of the dialog box.

MORE ABOUT

Automatic Sizing and Positioning If you omit either or both of the x and y position numbers for a dialog box or item, Microsoft Excel positions the dialog box or item for you. If you omit either the height or width for a dialog box or item, Microsoft Excel sizes the box or item for you. If you omit just one value, Microsoft Excel automatically adjusts the measurement for that dimension.

Creating Custom Data Forms You can define a custom dialog box and then use it as a custom data form for a database. You can use only static text and edit boxes on a custom data form. You enter database field names in the initial/result column to link items in the form to fields in your database. You set up the data form description just as you would for custom dialog boxes. For an example of a custom data form, see "Creating a Custom Data Form," in Chapter 9.

Creating Movable Custom Dialog Boxes You can create a custom dialog box that users can move around the screen, like the Formula Define Name dialog box. To create a movable custom dialog box, type a title in the first row of the text column in the dialog box definition table. (The text column is the sixth column in the definition table.) The title will appear in the title bar of the dialog box; you can use the title bar to drag the dialog box around the screen.

Using a Custom Dialog Box in a Command Macro

When you paste a dialog box from the Dialog Editor into a macro sheet, information about the coordinates and types of items for the dialog box are entered in the dialog box definition on the macro sheet.

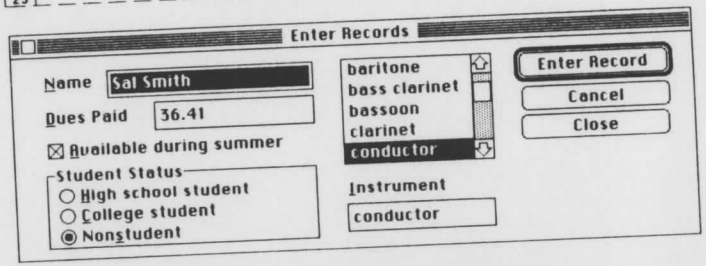
Layout of the Dialog Box Definition Table

The dialog box definition table has the following structure:

Column	Contents
1	Item number
2	X position of item's upper-left corner, measured in points
3	Y position of item's upper-left corner, measured in points
4	Width of item, measured in screen units
5	Height of item, measured in screen units
6	Text associated with item
7	Initial value or result for item

The first row of the dialog box definition table describes the dialog box itself. If the x-position and y-position columns are blank, Microsoft Excel centers the dialog box on the screen. Subsequent rows are for dialog box items. Each row describes one dialog box item. For example, here is a sample custom dialog box definition table and the resulting dialog box:

	I	J	K	L	M	N	O	P
1						Enter Records		
2						=DIALOG.BOX(enter_box)		
3						=RETURN()		
4								
5	item	x	y	width	height	text	init/result	
6				552	177	Enter Records		alto sax
7	1	412	12	120	21	Enter Record		bari sax
8	2	412	42	120	21	Cancel		baritone
9	3	412	66	120	21	Close		bass clarinet
10	5	24	14	50	18	&Name		bassoon
11	6	77	12	167	25		Sal Smith	clarinet
12	5	24	44	90	18	&Dues Paid		conductor
13	8	114	42	130	25		36.41	flute
14	5	268	110	100	18	&Instrument		french horn
15	6	268	138	120	25		conductor	mallets
16	16	268	12	120	90	r6c16:r21c16	7	oboe
17	14	24	96	220	72	Student Status		percussion
18	11	24	114				3	tenor sax
19	12	32	114	172	15	&High school student		trombone
20	12	32	132	164	15	&College student		trumpet
21	12	32	150	164	15	Non&student		tuba
22	13	24	72	220	18	&Available during summer	TRUE	
23								



Setting Initial Values in a Custom Dialog Box

To specify an initial value for a dialog box item using a command macro, use the SET.VALUE function to specify a value in the initial/result column of a dialog box item. For example, if you want the integer edit box labeled "Dues Paid" set to 40.00 when the dialog box is displayed, you would use the following formulas in your macros (the initial/result cell for the integer edit box is O15):

=SET.VALUE(O15,40.00)

To use the values the user enters in a custom dialog box, have formulas in your macros refer to the initial/result column for each item. For example, if you have users enter an integer in an integer edit box, your macro should refer to the initial/result column for the integer edit box item.

Using the Value Returned from a Custom Dialog Box

When the custom dialog box is run, the DIALOG.BOX function that displayed the dialog box returns the number of the dialog box item chosen to close the dialog box. It can then pass this number to other macros. For example, if the user chooses the Add button and that is the seventh item in the dialog box definition table, the DIALOG.BOX function returns the value 7. If the user chooses the Cancel button, the DIALOG.BOX function returns FALSE.

Items in a Custom Dialog Box

The following table describes each type of dialog box item.

Item	Type	Description
1	OK button (default)	Closes the dialog box, enters the data from the dialog box into the initial/result column, and returns control to the macro. The name of the button appears in the text column; the button does not have to be called OK. This button is already selected when the dialog box is displayed.
2	Cancel button (not default)	Closes the dialog box and returns control to the macro. The name of the button appears in the text column; the button does not have to be called Cancel.
3	OK button (not default)	Closes the dialog box, enters the data from the dialog box into the initial/result column, and returns control to the macro. The name of the button appears in the text column; the button does not have to be called OK.

Item	Type	Description
4	Cancel button (default)	Closes the dialog box and returns control to the macro. The name of the button appears in the text column; the button does not have to be called Cancel. This button is already selected when the dialog box is displayed.
5	Text	Fixed text that you can use to label items in the dialog box.
6	Text edit box	A box in which you can enter text. The box can be more than one line high. Enter the height of the edit box in the height column. The text column for this item is ignored. The initial value is the proposed contents of the edit box.
7	Integer edit box	Like a text edit box, except you can enter only integers from –32765 to 32767. The text column for this item is ignored. The initial value is the proposed contents of the edit box.
8	Number edit box	Like a text edit box, except you can enter only numbers. This edit box accepts formatted data. The initial value is the proposed contents of the edit box.
9	Formula edit box	Like a text edit box, except it accepts all formulas. References in the initial/result column are always R1C1-style references in the form of text. When these references are displayed in the dialog box, they are converted to the current style of the Microsoft Excel workspace (A1 style is set by default). If the user enters a constant, an equal sign is added before it. If the user enters text, it is enclosed in quotation marks.
10	Reference edit box	Like a text edit box, except you can enter only references. References in the initial/result column are always R1C1-style references in the form of text. When these references are displayed in the dialog box, they are converted to the current style of the Microsoft Excel workspace (A1 style is set by default).

Item	Type	Description
11	Option button group	An option button group item must immediately precede each group of option buttons. The text column can contain a label for the group. The initial/result column contains the number of the selected option button in the following group. The button in the row below the option button group item is button number 1, the next is number 2, and so on. If the initial/result column is blank, button 1 is assumed. If the initial/result column contains #N/A, no buttons are selected.
12	Option button	In a group of option buttons, only one button can be selected. The text column contains the name of the button.
13	Check box	The text column contains the name of the check box. The initial/result column contains TRUE if the check box is turned on, FALSE if it is turned off, or #N/A if the check box is grayed.
14	Group box	A box used to visually group items within your dialog box. The text column can contain a label for the group.
15	List box	Contains a list of items. The text column contains a reference to the items contained in the list. This can be an R1C1-style reference given as text, a name of a reference, or a name of an array. You can also specify the list by using any function that returns an array. (Do not include the equal sign for the function.) If the reference is to blank cells or is invalid, no items are displayed in the list box. The initial/result column contains the number of the selected item in the list box. The first item in the list box is item number 1, and so on. If the initial/result column is blank, number 1 is assumed. If the initial/result column contains #N/A, no items are selected. If the initial/result column contains a valid name, the list box becomes a multiple-selection list box, in which the user can select more than one item from the list, like the list of names in the Formula Apply Names dialog box. The name must refer to a single number or a one-dimensional array of numbers corresponding to the positions in the list of the initially selected values. Once the user selects

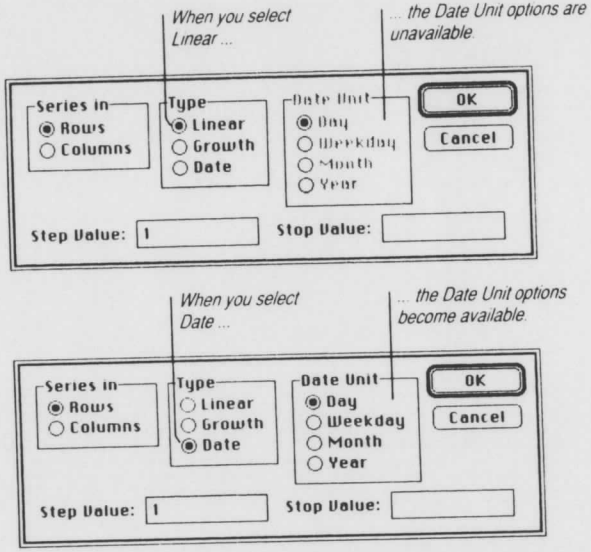
Item	Type	Description
		items from the list and closes the dialog box, the numbers in the named array change to match the selected items. The numbers appear in ascending order in the array. If a name matching the text in the initial/result column does not exist when the dialog box is opened, Microsoft Excel creates the name.
16	Linked list box	Like a list box, except it must be preceded by a text edit box (item 6). When an item is selected in the linked list box, the text of that item is displayed in the edit box. The text column contains a reference to the items contained in the list. This can be an R1C1 style reference given as text, a name of a reference, or a name of an array. You can also specify the list by using any function that returns an array. (Do not include the equal sign for the function.) If the reference is to blank cells or is invalid, no items are displayed in the list box. The initial/result column contains the number of the selected item in the list box. The first item in the list box is item number 1, and so on. If the initial/result column is blank, number 1 is assumed. If the initial/result column contains #N/A, no items are selected.
17	Icon	Displays one of three icons. The text column contains 1 when users must make a choice, 2 for presenting information to users, and 3 when an error has occurred. For illustrations of these icons, see the ALERT function in the *Microsoft Excel Function Reference*.
18	Linked file list box (Windows and OS/2 only)	Lists files in a directory. Must precede a linked drive and directory list box (item 19) and must follow a text edit box (item 6). The edit box is used to filter filenames to appear in the linked file list box. The text column is ignored.
19	Linked drive and directory list box (Windows and OS/2 only)	Lists available drives and directories. Must immediately follow a linked file list box (item 18). If a type 5 item (text) immediately follows a type 19 item, the type 5 item displays the name of the current drive and directory, and is updated if the drive or directory changes. The text and initial/result columns are ignored.

Item	Type	Description
20	Directory text (Windows and OS/2 only)	Displays the name of the current directory. Does not change after the dialog box is displayed. To display the directory name so it will change as the directory is changed, insert a type 5 item after a type 19 item. The text column and initial/result column are ignored.
21	Drop-down list box	Contains a list of items. The text column contains a reference to the items contained in the list. This can be an R1C1-style reference given as text, a name of a reference, or a name of an array. You can also specify the list by using any function that returns an array. (Do not include the equal sign for the function.) If the reference is to blank cells or is invalid, no items are displayed in the list. The height column (the fifth column) contains the length of the drop-down list when it is displayed. The initial/result column contains the number of the selected list item. The first item in the list is item number 1, and so on. If the initial/result column is blank, number 1 is assumed. If the initial/result column contains #N/A, no items are selected.
22	Drop-down combination edit/list box	Like a drop-down list box, except it must be preceded by a text edit box (item 6). Users can edit the item in the edit box before the list is displayed. The height column (the fifth column) contains the length of the drop-down list when it is displayed. The text column contains a reference to the items contained in the list. This can be an R1C1-style reference given as text, a name of a reference, or a name of an array. You can also specify the list by using any function that returns an array. (Do not include the equal sign for the function.) If the reference is to blank cells or is invalid, no items are displayed in the list. The initial/result column contains the number of the selected list item. The first item in the list is item number 1, and so on. If the initial/result column contains #N/A, the initial value is taken from the preceding text edit box. If the initial/result column is blank, number 1 is assumed. If the user types text in the box that is not contained in the list, the typed text is returned in the initial/result column of the preceding text edit box (type 6).

Creating Dynamic Dialog Boxes

You can create custom dialog boxes that change as users work with them to display or remove options, depending on what items are selected in the dialog box. Custom dialog boxes that change while in use are called *dynamic dialog boxes*.

An example of a dynamic dialog box is the Data Series dialog box. When you choose the Data Series command, the Date Unit options are unavailable. When you select the Date option under Type, the Date Unit options become available.



You create a dynamic dialog box by designating certain dialog box items as *triggers*. You do this by adding 100 to the item number in the dialog box definition table. For example, an OK button designated as a trigger has item number 101.

When a user selects or edits a dialog box item that is a trigger, your macro continues running but the dialog box remains on the screen. The DIALOG.BOX function returns the number of the selected item and the initial/result column is updated to reflect the user's selections. Your macro can then alter the dialog box definition as needed and redisplay the dialog box using the DIALOG.BOX function. For best results, the new dialog box should appear in exactly the same size and location as the last dialog box. To clear the dialog box from the screen without displaying a new one, use the function DIALOG.BOX(FALSE).

One use of dynamic dialog boxes is to dim dialog box items that are not available or do not apply to the task the user is doing. You can dim a dialog box item by adding 200 to its item number in the dialog box definition table. Thus, if you wanted to dim an option button, your macro would change the item number of that option button from 12 to 212.

For example, in the Data Series dialog box, the Date option in the Type box would have item number 112 and each option in the Date Unit group would have item number 212. When a user selected the Date option in the Type box, the macro would subtract 200 from the item number of all the option buttons in the Date Unit group and then redisplay the dialog box.

MORE ABOUT

More About Using a Custom Dialog Box in a Command Macro

Guidelines

Specifying a Help Topic for a Dialog Box You can put a Help topic reference in the first cell of the item column in the dialog box definition table. This creates context-sensitive Help for the dialog box. For information on creating custom Help topics, see "Creating a Custom Help Topic," later in this chapter.

Specifying Default Dialog Box Selection You can put a value in the first row of the initial/result column to specify which item in the dialog box is selected when the dialog box is displayed. Items are numbered starting with 1 in the second row in the dialog box definition table.

Items That Cannot Be Triggers in Dynamic Dialog Boxes Fixed text, group boxes (except option group boxes), icons and directory text (item numbers 5, 14, 17, and 20), and edit boxes (item numbers 6 through 10 and 22) cannot be used as triggers in dynamic dialog boxes.

Option Button Groups in Dynamic Dialog Boxes If the user selects a trigger option button in a trigger option button group, the option button takes priority over the group. The position of the option button in the dialog box definition table is returned to the DIALOG.BOX function that displayed the custom dialog box.

MORE ABOUT

Tips

Naming and Formatting the Dialog Box Definition Table The cell range containing the dialog box definition table remains selected after you paste it from the Clipboard, so you can immediately name the cell range and outline it using the Outline option in the Format Border dialog box. When you name the cell range containing the dialog box definition table, you can use that name as the argument to the DIALOG.BOX macro function. Putting an outline around a dialog box definition table can help you to locate it on your macro sheet.

Creating Dialog Box Definitions Manually Once you become familiar with the layout and values required for a dialog box definition, you may find it easier to create custom dialog boxes by typing the values directly into the macro sheet. Like the macro recorder, the Dialog Editor is a tool for automating and simplifying entering values and formulas on a macro sheet.

Using the Keyboard in Dialog Boxes You can use the keyboard to select fixed text, edit boxes, option buttons, check boxes, and list boxes in a custom dialog box. In the text column for the appropriate item, enter an ampersand (&) before the letter you want underlined. When the dialog box is displayed, you can press the key for the underlined letter to select that item. You must have command underlines turned on in the Options Workspace dialog box for the underlines to be displayed.

Creating a Custom Command

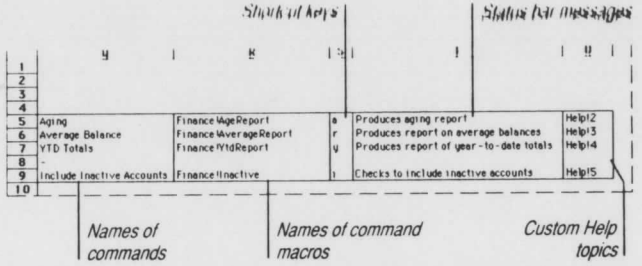
You can add your own commands to the Microsoft Excel menus or to menus you create. These added commands run the macros you have created, making them more accessible. Once you have added a command to a menu, you can:

- Change its name.
- Dim its name, making it unavailable.
- Add or remove a check mark next to it.
- Remove it from the menu.

For information on	See
Recording a macro	Chapter 18, "Automating Tasks with Command Macros"
Writing a macro	Chapter 19, "Designing and Writing a Command Macro"

Setting Up the Command Table

To add commands, you first create an area on your macro sheet to contain the information needed for the command. This area is called the *command table*. The command table is five columns wide and contains five types of information for each command: command name, command macro name, shortcut key, status message, and Help topic.



- **Command name** The first column contains the name of the command. If a cell in the first column contains a single hyphen (-), that menu position will contain a *separator line*, such as the line between the Edit Repeat and Edit Cut commands. If a character in the command name is preceded by an ampersand (&), that character will be underlined on the menu and you can press the key for the underlined letter to choose the command. To include an ampersand in any command name, type two ampersands.
- **Command macro name** The second column gives the command macro that corresponds to each command name. The macro names can be given as names or R1C1-style references in the form of text. The references can be to other macro sheets.
- **Shortcut key** The third column (optional) assigns a shortcut key to a command on a menu. Type any letter in the third column. Pressing COMMAND plus the key for this letter carries out the command immediately. The shortcut key appears in uppercase letters to the right of the command name on the menu. If a built-in command has the same shortcut key as a custom command, the shortcut key runs the custom command until the custom command is deleted.
- **Status message** The fourth column (optional) contains the text to be displayed in the status bar when the command name is selected.
- **Help topic** The fifth column (optional) specifies a Help topic to use with the command. If you specify a Help topic here, a custom Help topic is displayed when the user requests help on your custom command. For more information, see "Creating a Custom Help Topic," later in this chapter.

Adding a Command to a Menu

When you want to add a command to a menu, use the macro function:

=ADD.COMMAND(*bar_num,menu,command_ref,position*)

- The *bar_num* argument specifies the number of the menu bar for the command. For a list of menu bars and their numbers, see "Creating a Custom Menu," later in this chapter. (You can get the number of the active menu bar by using the GET.BAR function.)
- The *menu* argument specifies the menu to which the command will be added. You can give the name of the menu as text (for example, "Format"), the number of a built-in menu, or, for a custom menu, the number returned by the ADD.MENU function. The leftmost menu on the menu bar is numbered 1, the next menu to the right is numbered 2, and so on.
- The *command_ref* argument is a reference to the command table area on the macro sheet where commands are defined.
- The *position* argument can be either the name of the command before which the new command will be added, or a number specifying where you want the command to appear on the menu. The first command on a menu is numbered 1, the next command down is numbered 2, and so on. If the *position* argument is omitted, the command is added to the bottom of the menu.

ADD.COMMAND returns the position of the command.

For example, the following function adds a command before the Paste command on the Edit menu on the full worksheet menu bar:

=ADD.COMMAND(1,"Edit",R1:V1,"Paste")

Renaming a Command

You can change the name of a command on a menu. This can be useful to let users know which of two states is active, the same way the Options Protect and Options Unprotect commands do. When you want to change the name of a built-in or custom command on a menu, use the macro function:

=RENAME.COMMAND(*bar_num,menu,command,name_text*)

- The *bar_num* argument is the number of the menu bar containing the command you want to change.
- The *menu* argument is the name or number of the menu containing the command you want to change.
- The *command* argument is the name or menu position of the command you want to change.
- The *name_text* argument is the new name for the command.

For example, the following function changes the name of the command "Monthly Totals" to "Quarterly Totals" on the Report menu of the full worksheet menu bar:

=RENAME.COMMAND(1,"Report","Monthly Totals","Quarterly Totals")

The next time the macro is run, the command name could change back again:

=RENAME.COMMAND(1,"Report","Quarterly Totals","Monthly Totals")

Enabling and Disabling Commands

You can dim commands you add to menus to show that the command can't be used. To enable or disable commands, use the macro function:

=ENABLE.COMMAND(*bar_num,menu,command,enable*)

- The *bar_num* argument is the number of the menu bar containing the command you want to change.
- The *menu* argument is the name or number of the menu containing the command you want to change.
- The *command* argument is the name or menu position of the command you want to change.
- If the *enable* argument is TRUE, the command is enabled. If the *enable* argument is FALSE, the command name is dimmed and the command is unavailable.

For example, the following function disables the Include Inactive Accounts command on the Report menu of the full worksheet menu bar:

=ENABLE.COMMAND(1,"Report","Include Inactive Accounts",FALSE)

Adding or Removing Check Marks from a Command

A check mark next to a command name shows that the command is already in effect. Check marks are most commonly used with menu commands that specify a setting, such as the commands on the Gallery menu showing the current chart type. To add a check mark to or remove a check mark from a built-in or custom command, use the macro function:

=CHECK.COMMAND(*bar_num,menu,command,check*)

- The *bar_num* argument is the number of the menu bar containing the command you want to change.
- The *menu* argument is the name or number of the menu containing the command you want to change.
- The *command* argument is the name or menu position of the command you want to change.
- If the *check* argument is TRUE, the command name has a check mark. If the *check* argument is FALSE, the command name does not have a check mark.

For example, the following function adds a check mark next to the Include Inactive Accounts command name on the Report menu in the full worksheet menu bar:

=CHECK.COMMAND(1,"Report","Include Inactive Accounts",TRUE)

Deleting a Command from a Menu

When you want to delete a built-in or custom command, use the macro function:

=DELETE.COMMAND(*bar_num,menu,command*)

- The *bar_num* argument is the number of the menu bar containing the command you want to delete.
- The *menu* argument is the name or number of the menu containing the command you want to delete.
- The *command* argument is the name or menu position of the command you want to delete.

WARNING Don't delete the File Quit command unless you've included another way to quit Microsoft Excel.

For example, the following function deletes the Average Balance command from the Report menu on the full worksheet menu bar:

=DELETE.COMMAND(1,"Report","Average Balance")

MORE ABOUT

More About Creating a Custom Command

Guidelines

Changing or Deleting Built-in Commands You can also rename, check, or delete built-in commands using the RENAME.COMMAND, CHECK.COMMAND, and DELETE.COMMAND functions.

Restoring Deleted Commands You can restore deleted built-in commands to their original menus by using the ADD.COMMAND function with the command name used in place of the *command_ref* argument. You can't restore deleted custom commands.

Deleting the Recently Opened File List You can delete the list of most recently opened files from the File menu or the list of open windows from the Window menu by using the DELETE.COMMAND function with the name "File List" or "Window List" as the *command* argument.

Tip

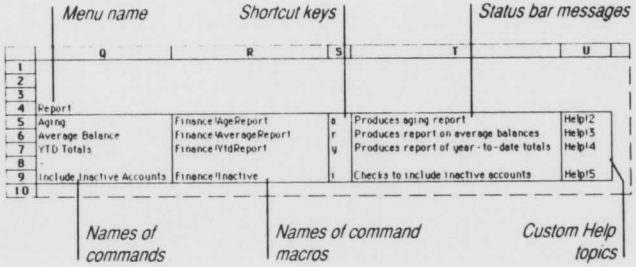
Using the Names of Commands and Menus Whenever possible, use the names of commands and menus, rather than position numbers, to specify the command you want to add, delete, or change and the menu bar on which the command appears. This ensures that you change the right command, and makes your functions easier to read.

Creating a Custom Menu

You can use macros to add, delete, rename, or disable built-in or custom menus on built-in or custom menu bars.

Setting Up the Menu Table

To add a menu, you first create an area on your macro sheet to contain the information needed for the menu. This area is called the *menu table*. The menu table is five columns wide and contains five types of information: menu and command names, command macro names, shortcut keys, status messages, and Help topics.



	Q	R	S	T	U
1					
2					
3					
4	Report				
5	Aging	Finance\AgeReport	a	Produces aging report	Help!2
6	Average Balance	Finance\AverageReport	r	Produces report on average balances	Help!3
7	YTD Totals	Finance\YtdReport	y	Produces report of year-to-date totals	Help!4
8	-				
9	Include Inactive Accounts	Finance!Inactive	i	Checks to include inactive accounts	Help!5
10					

- **Menu and command names** The first cell in the first column contains the menu name. The names of the commands in the menu are in the cells below the menu name. If a cell in the first column contains a single hyphen (-), that menu position will contain a separator line, such as the line between the Edit Repeat and Edit Cut commands. If a character in the command or menu name is preceded by an ampersand (&), the key for that character can be used to choose the command or select the menu. To include an ampersand in any command name, type two ampersands.
- **Command macro name** The second column gives the command macro that corresponds to each command name. The macro names can be external references in the form of text.
- **Shortcut key** The third column (optional) assigns a shortcut key to a command on a menu.

- **Status message** The fourth column (optional) contains the text to be displayed in the status bar when a command name is selected in the menu.
- **Help topic** The fifth column (optional) specifies a Help topic to use with each command. If you specify a Help topic here, a custom Help topic is displayed when the user requests Help on your custom command. For more information, see "Creating a Custom Help Topic," later in this chapter.

To add a menu, you also need to know the number of the menu bar to which you are adding a menu. Microsoft Excel has six menu bars:

File Edit Formula Format Data Options Macro Window

Worksheet menu bar
Full menu ID = 1
Short menu ID = 5

File Edit Gallery Chart Format Macro Window

Chart menu bar
Full menu ID = 2
Short menu ID = 6

File Edit Window

Null menu bar
Menu ID = 3

File Info Macro Window

Info window menu bar
Menu ID = 4

Only one menu bar is displayed at a time. You can get the number of the active menu bar by using the GET.BAR function.

Adding a Menu

When you want to add a menu to a new or built-in menu bar, use the macro function:

=ADD.MENU(*bar_num,menu_ref,position*)

- The *bar_num* argument is the number of the menu bar to which you want to add the menu.
- The *menu_ref* argument is the name or reference of the menu table for the menu you want to add.
- The *position* argument is the name or number of the menu before which you want to add the menu.

If no *position* is specified, menus are added immediately to the right of the rightmost menu on the menu bar. When a menu is added, 1 is added to *position* for all menus to the right of that menu.

For example, the following function adds the menu described in the menu table in C100:G105 to the full menu bar for worksheets.

=ADD.MENU(1,C100:G105)

Renaming or Disabling a Menu

To rename a built-in or custom menu, use the RENAME.COMMAND function. For the *command* argument, specify 0.

To disable a built-in or custom menu, use the ENABLE.COMMAND function. For the *command* argument, specify 0.

Deleting a Menu

When you want to delete a menu from a menu bar, use the macro function:

=DELETE.MENU(*bar_num*,*menu*)

- The *bar_num* argument is the number of the menu bar containing the menu you want to delete.
- The *menu* argument is the name or number of the menu you want to delete.

When a menu is deleted, 1 is subtracted from the position of all menus to the right of that menu.

For example, the following function deletes the Macro menu from the short menu bar for worksheets:

=DELETE.MENU(5,"Macro")

More About Creating a Custom Menu

MORE ABOUT

Guideline

Restoring Deleted Menus You can restore deleted built-in menus to their original menu bars by using the ADD.MENU function with the menu name in place of the *menu_ref* argument. However, any custom or add-in commands added to that menu will be lost.

Creating a Custom Menu Bar

You can create new menu bars or delete menu bars you have created. Each menu bar contains one or more menus. The Info menu bar, for example, contains the File, Info, Macro, and Window menus. Whenever the Info menu bar is displayed, these four menus are available.

Adding a Menu Bar

To add a menu bar, use the macro function:

=ADD.BAR()

The ADD.BAR function creates a new, empty menu bar and returns its menu bar number, but does not display it or add menus to it. You use the ADD.MENU function to add menus to a menu bar. For information on adding menus to menu bars, see "Creating a Custom Menu," earlier in this chapter.

Displaying a Menu Bar

To display a menu bar, use the macro function:

=SHOW.BAR(*bar_num*)

- The *bar_num* argument is the number of the menu bar you want to display. The menu bar number was returned by the ADD.BAR function when the menu bar was added.

When you display the new menu bar or add menus or commands to it, you identify it by using the menu bar number. You can also refer to the cell containing the ADD.BAR function instead of using the menu bar number. That way, your macro will work correctly regardless of how many bars have been added. For example, if cell P2 contains the ADD.BAR function, use the following function to display the menu bar:

=SHOW.BAR(P2)

You can also use the SHOW.BAR function with other functions to switch between menu bars. For example, you could use the ON.WINDOW macro function to run the Tax_Menus macro, which contains the SHOW.BAR function, and display a custom menu bar whenever a worksheet called Tax is activated:

=ON.WINDOW("Tax","Tax_Menus")

Deleting a Menu Bar

Use the DELETE.BAR macro function to delete menu bars that you have created.

=DELETE.BAR(*bar_num*)

- The *bar_num* argument is the number of the menu bar you want to delete. The menu bar number was returned by the ADD.BAR function when the menu bar was added.

For example, if you have 15 custom menu bars defined (the maximum) and want to add another, delete any bar you are not using with DELETE.BAR before adding the new menu bar with the ADD.BAR function. Make sure you don't use the numbers of any deleted menu bars as arguments in other functions.

Creating a Custom Help Topic

You can create and display your own help information for

- Context-sensitive Help for a custom dialog box.
- Context-sensitive Help for a custom command or menu.
- Messages displayed in the course of running a macro.

You enter Help topics in one or more Help files saved in a plain-text format. A Help topic starts with an asterisk, a topic number, and a short optional comment, followed by the actual Help information. A topic number can be any integer. Topics don't have to be in consecutive order. You can use comments to identify topics, but they are not displayed with the topics.

For example, suppose Help topic 58 describes filling out forms in a custom application. The topic looks like this:

```
*58 Filling out forms
To start filling out forms, choose File New Form. Fill in the fields. Press TAB
to move between fields.
```

To specify a Help topic for a command or dialog box, enter a Help reference in the fifth column of a command table, in the first cell in the item column in the dialog box definition table for a custom dialog box, or with the HELP function. A Help reference has the following syntax:

file_name!*topic_number*

For example, to specify the topic numbered 58 in the file Macro Help, you would use the Help reference **macro help!58**.

When using custom Help, the Next and Previous buttons jump to the custom Help topic with the next highest or lowest topic number.

Creating Add-in Functions and Command Macros

Any macro or custom function you create in Microsoft Excel can be made into an *add-in macro*. Add-in macros are command macros or custom functions that appear to be part of Microsoft Excel.

You create an add-in macro by saving a macro sheet in the Add-In file format. When you open an add-in macro sheet, the following things happen automatically:

- The add-in macro sheet is hidden and cannot be unhidden using the Window Unhide command.
- Custom functions in the add-in macro sheet are listed in the Paste Function dialog box in alphabetical order, without the name of a macro sheet preceding them.
- Macros in the add-in macro sheet do not appear in the Macro Run dialog box.

The name of the macro can be used just like a built-in function. You don't need to include the name of the add-in macro sheet in front of the macro name. For example, if an open add-in macro sheet contains a macro called Delete_Month, you could use that macro in another macro sheet by typing the following:

=delete_month()

If Delete_Month were on a regular macro sheet named Report, you'd have to type:

=report!delete_month()

In addition, the following commands work differently when an add-in macro sheet is open:

- The File Close All command does not close add-in macro sheets.
- The File Quit command does not prompt users to save changes to the add-in macro sheet. If the add-in macro sheet must be saved when the user is finished with it, add the SAVE function to an auto-close macro for the macro sheet.

Saving a macro sheet as an add-in macro sheet

Save a macro sheet as an add-in macro sheet when you want the macros and custom functions on the macro sheet to appear as part of Microsoft Excel.

1. Activate the macro sheet.
2. Choose File Save As.
3. If you want, type a new name for the macro sheet.
4. Choose the Options button.
5. In the File Format box, select the Add-In option.
6. Choose OK.
7. Choose OK again.

Opening an add-in macro sheet as a regular macro sheet

You can open an add-in macro sheet as a regular macro sheet when you need to read or edit the macros and custom functions in the macro sheet. Opening an add-in macro sheet as a regular macro sheet does not run any auto-open macro for the macro sheet.

1. Choose File Open.
2. Select the name of the add-in macro sheet.
3. Hold down SHIFT and choose the Open button.

NOTE If a message is displayed before the macro sheet opens, such as for entering a password, you must also press SHIFT while you choose OK in that message.

4. Choose Window Unhide.
5. Select the name of the add-in macro sheet you opened.
6. Choose OK.

MORE ABOUT

More About Creating Add-in Functions and Command Macros

Tips

Using an Add-in Macro as a Startup Document To run an add-in macro every time you start Microsoft Excel, you can place it in the startup folder. For more information on startup folders, see "Specifying a Startup Folder and Document" in Chapter 16.

Protecting Add-in Macros If you don't want users to be able to see the contents of your add-in macro sheet, you can protect it. For information on protecting documents, see "Protecting Documents and Windows" in Chapter 16.

Using Templates with Add-in Macros Templates and add-in macros work well together to create custom applications. You can create a template of a form users need to fill out; then create an auto-open macro for the template that opens the add-in macro sheet for the template. For information on templates, see "Creating and Using a Document Template" in Chapter 16.

Using a Code Resource as a Custom Function

A code resource library contains code resources written in a programming language, such as C or FORTRAN. You can use code resources contained in code resource libraries as custom functions on a Microsoft Excel worksheet or macro sheet. Often a code resource runs faster than the same function written as a custom function on a Microsoft Excel macro sheet. This section assumes that you understand custom functions, you already have a code resource library you want to use, and you know the names and arguments of the code resources contained in it.

For information on	See
Creating custom worksheet functions	Chapter 17, "Creating and Using Custom Worksheet Functions"
Using functions	"Using Worksheet Functions to Simplify Formulas" in Chapter 3

Registering a Code Resource as a Custom Function

To use a code resource as a custom function on a worksheet or macro sheet, first use the REGISTER function on a macro sheet to specify which code resource library and code resource you want to use. You must use the REGISTER function once for each code resource you want to use as a custom function.

=REGISTER(*module_text*,*procedure_text*,*argument_text*,*function_name*, *name_text*)

- The *module_text* argument is the name of the code resource library, enclosed in quotation marks, or a name that refers to the name of the code resource library.
- The *procedure_text* argument is the name of the code resource in the code resource library. The argument can be the name of the code resource enclosed in quotation marks or a name that refers to the name of the code resource.
- The *argument_text* argument is the data type for the value returned by and each of the arguments used by the code resource. To specify the type of an argument, you use one of the codes described in the REGISTER function in the *Microsoft Excel Function Reference*. You must enclose the arguments in quotation marks.

WARNING Make sure you correctly specify the data type for the arguments and the return value of a routine from a code resource library. Incorrect data types may force you to restart your computer.

- The *function_name* argument (optional) is the name you want to use for the custom function, enclosed in quotation marks. This can be the same as the name of the code resource itself, or it can be another name. This is the name that appears in the list of functions in the Formula Paste Function dialog box.
- The *name_text* arguments (optional) are the arguments used by the code resource. You must enclose the arguments in quotation marks. If there is more than one argument, separate the arguments with commas. These argument names are pasted with the function when the Paste Arguments check box is turned on in the Formula Paste Function dialog box.

For example, suppose you have a code resource library containing specialized functions for solving chemical equations. The library is called Chemical Library and it contains a code resource called "Moles" that calculates the number of moles in a given amount of an element. To use the MOLES function in your worksheet, you would first use the following REGISTER function on a macro sheet:

```
=REGISTER("Chemical Library","Moles",">EC","MOLES","grams,element")
```

Once you run this macro statement, you can use the Formula Paste Function command to paste the MOLES function into your worksheet.

MORE ABOUT

More About Using a Code Resource as a Custom Function

Guidelines

Languages Supported Microsoft Excel can use code resource libraries created in most popular programming languages, including C, FORTRAN, COBOL, and Pascal.

Pasting Argument Data Types If you omit the fifth argument in the REGISTER function and you use the Paste Arguments check box in the Formula Paste Function dialog box with a custom function connected to a code resource library, Microsoft Excel pastes the data type for each argument. Using the preceding example, if you turned on the Paste Arguments check box for the MOLES function, Microsoft Excel would paste the following into the selected cell:

```
=MOLES(number,text)
```


Creating an International Macro Sheet

You can create macros that run in any language version of Microsoft Excel. International macro sheets are intended for macro developers creating custom applications to be used with various language versions of Microsoft Excel.

Usually, when you open a Microsoft Excel macro sheet in another language version of Microsoft Excel, functions and formulas are converted to the language of the Microsoft Excel version you are using. All text within quotation marks is not translated. This can cause problems when formulas and references are inside quotation marks.

When you create an international macro sheet and then open it in a non-English version of Microsoft Excel, functions are not translated into the language of the current Microsoft Excel version. Instead, functions and formulas remain in English. The U.S. settings are also retained for items controlled by the system, such as decimal separators. This ensures that formulas, references, and formats inside quotation marks work correctly. You may still need to translate some quoted text strings you defined, such as titles and labels, but the macro will run in all versions of Microsoft Excel.

When an international macro sheet is the active sheet, Microsoft Excel displays and uses U.S. defaults; for example, the Format Number dialog box shows the U.S. number formats, and the Paste Function dialog box shows the English function names. When a regular non-English worksheet or macro sheet is the active sheet, Microsoft Excel displays and uses the defaults of the appropriate language.

For example, say you want to create a custom real estate application that needs to work in English and French Microsoft Excel. You can open a new international macro sheet, create your macros, and save your macro sheets as you normally would. When you open the international macro sheet in French Microsoft Excel, all the functions and quoted text strings remain in English, instead of French, and will run. You may still need to translate some quoted text strings you defined in custom dialog boxes or error messages.

Creating a new international macro sheet

You create a new international macro sheet by using the File New command. The International Macro Sheet option appears in the File New dialog box when you use Microsoft Excel with a system for a language other than U.S. English.

1 Chose File New.

2 In the list, select International Macro Sheet.

3 Choose OK.

Record or write your macros as you normally would. When you open the macro sheet in another language version of Microsoft Excel, all functions and formulas remain in English and will run. Quoted text strings also remain in English, but formulas and references won't need to be translated.

Saving a macro sheet as an international macro sheet

Save an existing macro sheet as an international macro sheet if you want existing macros to work in another language version of Microsoft Excel.

NOTE Quoted text strings remain in English and may need to be translated.

1. Open the macro sheet.
2. Choose File Save As.
3. Choose the Options button.
4. In the File Format box, select the Int'l Macro option.
5. Choose the Save button.

   If you created the macro sheet using U.S. English Microsoft Excel, there will be no visible change. If you created the macro sheet using any other language version of Microsoft Excel, or country settings other than U.S., functions and formulas are converted to English and country settings are converted to U.S. settings.

Now when you open the macro sheet in another language version of Microsoft Excel, functions and formulas remain in English and will run.

MORE ABOUT

More About Creating an International Macro Sheet

Guidelines

Cannot Mix International and Regular Macros You cannot have regular macros and international macros on the same macro sheet.

Cannot Run International with Previous Version of Microsoft Excel You cannot open and run international macro sheets in previous versions of Microsoft Excel.

Number Formats in International Macro Sheets In international macro sheets, built-in number formats are interpreted by their position in the list of built-in formats. The format string stored in the macro corresponds to an English number format, but the format displayed when the macro runs is the international number format occupying the same space in the list of built-in number formats.

MORE ABOUT

For custom number formats, the following items must be stored in the international macro sheet as U.S. formats. They are then displayed in the local format when the macro is run:

- Decimal and thousand separators
- Time and date separators
- Color names

Currency Symbols in International Macro Sheets In international macro sheets containing numbers formatted as currency, Microsoft Excel converts thousand separators and decimal points, but not currency symbols. Instead, Microsoft Excel creates a custom format using the proper decimal points and separators but the previous currency symbol. This appears as a custom format at the bottom of the list of formats in the Format Number dialog box. You can edit this custom format to change the currency symbol to the appropriate one for the worksheet.

For example, if your international macro sheet contains the number $5,100.00 and you open the macro sheet in French Microsoft Excel, the number would be formatted as $5 100,00 using a space for a thousand separator and a comma for a decimal mark. The custom format Microsoft Excel creates for this number would be \$# ##0,00. You could select all the cells with the new format, change the format to # ##0,00 F and all numbers with the format would then be displayed as French currency.

Accepting User Input in International Macros When international macros are running, user input is expected to be in the local language. Since Microsoft Excel uses the U.S. defaults when an international macro sheet is active, be sure that a worksheet or chart is the active document when users must supply input to the macro.

Custom Commands in International Macros When using the ADD.COMMAND, DELETE.COMMAND, RENAME.COMMAND, and ENABLE.COMMAND functions in international macro sheets, you can specify either the position of the menu or command or the name of the U.S. English Microsoft Excel menu or command.

Moving Data to or from International Macro Sheets When you paste cells from a regular macro sheet into an international macro sheet, the cells are changed to run in all language versions of Microsoft Excel. When you paste cells from an international macro sheet to a regular macro sheet, the cells are converted to the language version of Microsoft Excel using the macro sheet. In both cases, quoted text strings might require some manual translation.

MORE ABOUT

Function Arguments That Need No Translation The arguments to the ON.KEYS, SEND.KEYS, CELL, and SELECT functions do not need to be translated. All language versions of Microsoft Excel version 3.0 accept arguments in English for these functions.

Creating International Add-in Macros You can create an add-in macro sheet that works with international versions of Microsoft Excel by using the File Save As command to save the macro sheet in the Int'l Add-In format.

Appendix A Features and Specifications

This appendix lists the features and specifications of Microsoft Excel. You will find features and specifications sections for each major section.

Table of Contents

Program ... 655
Worksheets ... 656
Charts ... 660
Application Development ... 662
Data Exchange ... 664

Program

Features

- **Program**
  Multitasking with other applications
  Virtual memory
  Multiple applications running at one time (limited only by available memory)
  Addressing all available memory for cell table and heap
- **Interface**
  Extensive keyboard interface
  Undo command
  Repeat command
  Short and full menus
  Progress message during long operations
- **Document management**
  Workspace files
  Automatic tiling of document windows
  Hiding and unhiding windows
  One-step access to any visible window
  Multiple documents open at one time (limited only by available memory)
- **File management**
  Network support
  File protection and encryption
  Automatic file backup

- **Printing**
  Interactive print preview
  Landscape printing (on printers that support landscape printing)
  Printing with page headers and footers
  Full laser printer support
- **Online documentation**
  Context-sensitive Help
  Help for Lotus 1-2-3 users
  Help for Microsoft Multiplan users
  Microsoft Excel Tutorial

Worksheets

Features

- **Presentation**
  Multiple fonts in a worksheet
  Variable row heights
  Cell styles
  Cell borders with colors
  Seven border types
  Cell shading with foreground and background colors and 17 patterns
  Text boxes with multiple fonts on worksheet or macro sheet
  Text wrapping within cells
  Text justification within a cell range
  Drawing tools for creating lines, rectangles, ovals, and arcs on worksheets
  Imported graphics displayed on worksheet or macro sheet
  Optional worksheet gridlines
  User-defined number and text formats
  Customizable palette of 16 colors with up to 16 million color choices
  Separate formats for positive, negative, and zero values and text
  Conditional cell formats
  Eliminating last three, six, or nine digits for financial reporting
  Round to fixed number of decimal places
  Suppressing zeros throughout sheet or in individual cells
  Frozen titles in display and in printout
  Automatic or manual page break control
  Interactive print preview
  Printing a worksheet followed by its cell notes
  Printing multiple ranges in a single print operation
  Printout centered horizontally and vertically on a page
  Printout fit to a single page
  Best fit column widths

- **Modeling**
  Intelligent worksheet linking
  Worksheet outlining
  Goal seeking
  Applying existing names to formulas
  Naming of ranges, values, and formulas
  Absolute and relative range names
  Range operators (intersection, union)
  Array formulas
  Matrix and multiple regression functions
  One-way (horizontal or vertical) and two-way tables
  Automatic updating of tables
- **Auditing**
  Cell notes
  Cell note markers to show which cells contain notes
  Info window for viewing or printing cell attributes
  Selection of cell precedents and dependents
  Selection of formulas and constants
  Selection of cells containing errors, numbers, text, or logical values
  Selection of inconsistent formulas in a row or column
  Selection of last worksheet or macro sheet cell
  Circular reference indicator pointing to specific cell
  Option to display formulas or values
  A1 or R1C1 reference style
  Cell locking and formula hiding
- **Editing**
  Find and replace features
  Insertion and deletion of individual cells or cell ranges
  Applying an operation while copying cell ranges
  Skipping blank cells while copying cell ranges
  Transposing cell ranges
  Filling ranges with a series of numbers or dates
  One-step selection of current region
  One-step selection of current array
  One-step selection of current row, current column, or whole worksheet
  Simultaneous selection of multiple cell ranges
  Pasting function names and argument placeholders
  Pasting names

- **Database**
  Data form
  Computed and protected fields in data form
  Simple or computed criteria in worksheet
  Extracts from databases on other worksheets
  Linking to databases on other worksheets
  Named extract range
- **Calculation and memory**
  Minimal recalculation
  Sparse matrix memory management
  Calculation of all worksheets or active worksheet only
  Manual, automatic, and automatic except tables calculation
  Automatic sum button

Specifications

Worksheet dimensions	
Maximum worksheet size	16,384 rows by 256 columns
Column width	0 to 255 characters
Row height	0 to 409 points
Maximum length of cell contents (text)	255 characters

Formats	
Built-in number formats	14
Built-in time and date formats	9
Custom formats	233
Total formats	256

Colors and fonts	
Maximum number of colors per worksheet (actual number depends on number of colors supported by monitor or printer)	16
Maximum number of fonts per worksheet	256

Functions	
Built-in worksheet functions	
Database	12
Date and time	14
Financial	14
Information	23
Logical	6
Lookup	8
Mathematical	16
Matrix	5
Statistical	14
Text	21
Trigonometric	13
Total worksheet functions	146
Built-in macro functions	
Command equivalent	156
Action equivalent	33
Customizing	29
Control	33 for Microsoft Excel for Windows or OS/2 32 for Microsoft Excel for the Macintosh
Value-returning	26
Total macro functions	277 for Microsoft Excel for Windows or OS/2 276 for Microsoft Excel for the Macintosh

General	
Number precision	15 digits
Maximum number of arguments per function	14
Maximum number of custom functions	Limited only by available memory
Maximum number of names per worksheet	Limited only by available memory
Maximum number of tables per worksheet	Limited only by available memory
Maximum number of iterations	32,767
Maximum number of linked worksheets	Limited only by available memory
Maximum number of windows per worksheet	Limited only by available memory
Maximum number of panes per window	4
Maximum number of selected ranges	2,048

Database	
Maximum number of records	16,383
Maximum number of fields	256
Maximum length of field	255 characters
Number of sorting keys	3 in a single sort; unlimited when using sequential sorts

Charts

Features

- **General**
  Charts created on worksheet or macro sheet
  Two-dimensional and three-dimensional charts
  Imported graphics used as picture chart markers
  Chart points can be dragged to change worksheet values
  Chart legend can be dragged
  Chart text can be rotated
  One-step creation of charts based on worksheet selection

- **Formatting**
  Bypassing missing data points
  Optional inversion of marker pattern for negative values
  Linear, logarithmic, and semilogarithmic axis scales
  Major and minor axis gridlines
  One-step chart formatting
  Direct access between formatting commands
  Formatting chart with arrows, legend, title, attached and unattached text labels
  Linking legend, title, and text labels to worksheet cells
  Control of spacing between category tick marks
  Control of chart width/height ratio
  User-defined default chart type
  Main/overlay combination charts

Specifications

Built-in formats for each chart type	
3-D area	7
3-D column	7
3-D line	4
3-D pie	6
Area	5
Bar	7
Column	8
Line	8
Pie	6
XY (scatter)	5
Combination	5
Total built-in chart formats	68

Chart information	
Maximum number of charts linked to a worksheet	Limited only by available memory
Maximum number of worksheets referred to by a chart	255
Maximum number of series in one chart	255
Maximum number of data points per series	4,000
Maximum number of total data points	32,000

Formatting	
Maximum number of fonts in one chart	255
Available line styles	8
Available line weights	4
Available area patterns (screen display)	18
Available foreground colors (color display)	16 out of 16 million
Available background colors (color display)	16 out of 16 million
Total area pattern and color combinations (color display)	4,096
Maximum number of area patterns (printer)*	18
Maximum number of foreground colors (color printer)*	16
Maximum number of background colors (color printer)*	16
Maximum number of pattern and color combinations (color printer)**	4,096

*Actual number depends on your printer and its software.

Application Development

Features

- **Macro language**
  Procedural macro language
  Assigning and looping macro statements
  Looping over a range of cells
  Block IF statements
  Indenting block statements
  Macro control of all Microsoft Excel functionality
  Macro control of other applications (via DDE or SEND.KEYS)
  Data exchange with other applications by using macros
  Calling subroutine libraries by using macros
  Support for Macintosh AppleEvents (only on Microsoft Excel for the Macintosh using system software version 7.0)

- **Programming tools**
  Dialog Editor application
  Debugging add-in
  Macro recorder
  Jump to macro statement containing error
  Single-stepping through macros
- **Macro sheets**
  Startup directory or folder
  Macros stored separately from worksheets
  Document templates
  Hidden names on macro sheets
  International macro sheets
  Macros assigned to graphic objects
  Sharing macros among documents
  Encryption for protected files
  Macro access to text files
  Protection of document contents
- **Control over running macros**
  Triggering of macros when opening and closing files
  Triggering of macros at specified times
  Triggering of macros upon recalculation of worksheet
  Triggering of macros upon activation of a window
  Triggering of macros upon receipt of data from another application
  Triggering of macros upon selection of dialog box item
- **Customization**
  Macro keyboard reassignment
  Custom buttons on worksheets and macro sheets
  Customizable built-in menus
  Custom worksheet functions
  User-defined menus
  User-defined commands
  User-defined dialog boxes that can be updated
  User-defined data forms
  User-defined Help topics
  User-defined error handling
  User-defined undo, repeat, and macro recording commands
  Protection of window layout
  Hiding of windows, status bar, scroll bars, formula bar, and tool bar

Specifications

Function and customizing information	
Macro sheet functions	277
Worksheet functions	146
Total functions available	423
Maximum number of files that can be simultaneously accessed by macro	Limited only by operating system
Maximum number of custom menu bars that can be defined at one time	15

Data Exchange

Features

Direct opening and saving of files in all supported formats
Macro Translation Assistant to import macros from Lotus 1-2-3 and Multiplan
Parsing of text files by fixed-width columns
Copying data to or from other applications by using the Clipboard
Data links to or from other applications through dynamic data exchange (DDE) (in Microsoft Excel for the Macintosh, available only when using system software version 7.0)

Specifications

File formats for opening and saving	Filename extension (Windows or OS/2 only)
Microsoft Excel file format	.XLS, .XLC, .XLM, .XLW, .XLA, .XLT
Text format	.TXT
Comma-separated values format	.CSV
Symbolic link format	.SLK
Lotus 1-2-3 Release 1A and Lotus Symphony format	.WKS
Lotus 1-2-3 Release 2.0 format	.WK1
Lotus 1-2-3 Release 3 format	.WK3
Data interchange format	.DIF
dBASE II format	.DBF 2
dBASE III format	.DBF 3
dBASE IV format	.DBF 4
Microsoft Excel version 2.*x* format	.XLS, .XLM, .XLC, .XLW

Microsoft Excel supports the following Clipboard formats:

Format	Clipboard type identifier
Microsoft Excel file format	BIFF, BIFF3
Text	Display Text, OEM Text
Text (tab delimited)	Text
Formatted text	Rich Text Format*
Comma-separated values	CSV
Symbolic link format	SYLK
Lotus 1-2-3 Release 2.0 format	WK1
Data interchange format	DIF
Embedded object	Native, OwnerLink, Picture, or other presentation format
Linked object	OwnerLink, ObjectLink, Link, Picture, or other presentation format
Values	Value for the Macintosh
Standard graphics format	CGM for Microsoft Excel for Windows or OS/2
Picture	PICT for the Macintosh; Picture* for Microsoft Excel for Windows or OS/2
Bitmap	Bitmap for Microsoft Excel for Windows or OS/2

*From Microsoft Excel only

Appendix B Microsoft Excel Library

The Microsoft Excel library contains sample models and add-in macros that offer ideas on how to combine Microsoft Excel features to create powerful worksheets, macros, and models. The files in the library also provide added utility to help you put Microsoft Excel to work right away.

You can find the library in the Macro Library folder inside your Microsoft Excel folder, if you installed it when you ran the Microsoft Excel Macro program. If the Library folder is not present, run the setup program again. The installation program will install the macro library for you.

The first two sections of this appendix describe the sample models and add-in macros contained in the library. The third section provides some tips and guidelines for creating your own models.

Table of Contents

Using the Sample Models ... 667

Using the Add-in Macros ... 672

Creating Your Own Models ... 693

For More Information ... 696

Using the Sample Models

The Microsoft Excel library contains six sample models that you can directly adapt to fit your needs or use for inspiration in creating your own models. This section describes the models from the simplest to the most complicated. For information on designing your own models, see "Creating Your Own Models," later in this appendix.

The sample models included in the Microsoft Excel library are listed in the following table:

Sample model	Description and filename
Billing Template	Contains a formatted billing template. (Bill Template)
Break-Even Analysis	Calculates the break-even point for a company. (Break Even)
Amortization Table	Calculates loan balances and interest and principal payments. (Amortization Table)
Budget	Uses worksheet outlining features to organize an annual budget for a small real estate firm. (Annual Budget)
College Expense Planning	Projects college expenses and generates a plan to meet them. (College Expenses, College Helper)
Sales Tracking	Records sales data and performs monthly analysis using embedded charts. (Sales Database, Sales Analyzer, Sales Analyzer Macro, Sales Tracking)

Billing Template

The sample file named Bill Template is a Microsoft Excel template used by a fictitious weekly newspaper, the *Courier/Observer*, for billing advertisers. The template contains a billing form complete with formatting and formulas. To print individual bills, users replace the fictitious data in the template with specific information.

Notice how text boxes and custom number formats are used in the template. By formatting a frequently used form and saving it as a template, you can save time.

For information on	See
Formatting a worksheet	Chapter 5, "Formatting a Worksheet"
Text boxes	"Adding Comments to a Worksheet" in Chapter 6
Custom number formats	"Entering Worksheet Data" in Chapter 3
Templates	"Creating and Using a Document Template" in Chapter 16

Break-Even Analysis

Break-even analysis attempts to predict how much revenue a company must earn to prevent losses—that is, to attain zero profit. The analysis takes two numbers as input: a company's fixed cost of doing business, and a contribution margin that reflects the relationship of variable costs to revenue. (The model also takes a third variable, called Increment, which changes the way the results of the break-even analysis are displayed.)

The sample file named Break Even is a simple model that performs a basic break-even analysis for your company. You will need to know (or estimate) your fixed costs and your contribution margin. You may need to create a separate worksheet to calculate these values.

Once you enter your fixed expenses and contribution margin into the Assumptions section of the model, it will calculate your break-even point. In addition, the model calculates the profit/loss figures for an interval right around your break-even point and plots them in a chart. This extra analysis can help you see how sensitive your bottom line is to fluctuations in your revenue.

If you plan to perform a break-even analysis for your company, you should be aware of some of the method's inherent limitations. First, it assumes a constant contribution margin across different revenues—an assumption that rarely occurs. Second, it assumes that your product mix will remain the same over time. Unless you sell only one product, this is also a faulty assumption. For these reasons, you should view basic break-even analyses as only rough estimates of your true break-even point.

For information on	See
Embedded charts	"Creating a New Chart" in Chapter 11
Using names	"Naming Cells and Formulas" in Chapter 6

Amortization Table

The sample file named Amortization Table contains an amortization table that calculates the beginning balance, interest and principal payments, and ending balance for any 24 consecutive payment periods of a loan. You can let the model calculate a periodic payment amount, or you can enter your own.

To use the table, change the appropriate data in the Assumptions section. Microsoft Excel automatically recalculates the table based on the information you enter.

For information on	See
Worksheet names	"Naming Cells and Formulas" in Chapter 6
Financial functions	The PV function in the *Microsoft Excel Function Reference*

Budget

The sample file named Annual Budget shows a sample budget forecast for a real estate company. Because it uses worksheet outlining features, the budget worksheet allows a user to easily browse through the budget, selectively hiding or showing various levels of detail.

The fictitious Trey Real Estate Company has several regional offices in addition to its headquarters in Minneapolis. For each office, the budget forecast shows projected expenditures in several accounting categories, with the firm's general ledger code for each category listed to the right. After the budget is approved, the accounting codes could be used to upload the budget directly from Microsoft Excel into a mainframe general ledger application. Alternately, they could be used as indexes for lookup functions on other Microsoft Excel worksheets that refer to this budget worksheet.

When a user opens the outlined model worksheet, Microsoft Excel displays a worksheet bordered on the top and left by outlining symbols. In the upper left of this symbol area is a set of four buttons arranged vertically, labeled 1 through 4. Users can quickly move through levels of summary detail in the budget by choosing one of these buttons. Choosing the 1 button will hide all the supporting detail, displaying only year-end figures for each category. Choosing the 4 button will show all the detail, broken down by month, for each category.

Levels of detail in each category can be controlled similarly by clicking one of the two buttons arranged horizontally in the upper left of the outlining symbols area. Choosing the 1 button will show only totals by office, while choosing the 2 button will display supporting figures by accounting category within each office.

If you create your own budget, you may want to use the auto-sum button in the tool bar to speed up the entry of SUM formulas on the worksheet, and use the Create Outline command to rapidly build an outline on your worksheet.

For information on	See
Worksheet outlining	"Outlining a Worksheet" in Chapter 6
Transferring data from Microsoft Excel to other applications	"Exchanging Documents with Other Applications" in Chapter 8
Lookup functions	"Creating a Lookup Table" in Chapter 7
Linking worksheets	"Linking Documents" in Chapter 8
Automatically inserting a SUM formula	"More About Using Worksheet Functions to Simplify Formulas" in Chapter 3

College Expense Planning

With rapidly rising college costs, many parents are worrying about how to pay for their children's higher education while the kids themselves are still in preschool. The College Expense Planning model projects the costs of college for young children and helps families plan to meet those costs.

The College Expenses model is contained in two files—the worksheet named College Expenses, and the macro sheet named College Helper. Most of the work is done by the worksheet; the macro sheet contains a custom function used by formulas on the worksheet.

To use the model, enter the information about your children in the Family Data section and information about your investment assumptions in the Investment Assumptions section. Then press COMMAND+EQUAL SIGN or choose the Options Calculate Now command to recalculate the model.

For information on	See
Financial functions	The PV function in the *Microsoft Excel Function Reference*
Array formulas	"Creating and Using an Array Formula" in Chapter 7
Custom functions	Chapter 17, "Creating and Using Custom Worksheet Functions"

Sales Tracking

The Sales Tracking model—which consists of the worksheets named Sales Database and Sales Analyzer and the macro sheet named Sales Analyzer Macro—analyzes sales and projects month-end results based on current data.

The Sales Database worksheet contains a simple database that records each sale made by the fictitious Aperture Film Distributors, Inc. Aperture sells only three products—developing chemicals, film, and photographic paper—and has a sales staff of three. For each sale, the date, salesperson, customer, product, quantity, and total price are entered into the database using a data form.

Managers at Aperture can use the worksheet Sales Analyzer to analyze month-to-date sales and project month-end sales for any of their products or salespeople. In addition, the worksheet contains embedded charts to graphically represent the analysis. That way, the user can quickly see how the numbers relate to each other.

Frequently performed operations for the sales tracking model are automated by macros in the macro sheet named Sales Analyzer Macro and assigned to buttons on the model's two worksheets. Tasks such as defining a print area or sorting the database after each set of entries are automatically performed by the model when a user clicks one of the worksheet buttons, thus speeding daily use and reducing the training required to use the model.

All three files in the model are included in the workspace file named Sales Tracking. When the workspace file is opened, Microsoft Excel automatically opens the model's three files.

For information on	See
Embedded Charts	"Creating a New Chart" in Chapter 11
Database functions	"Database Functions" in the *Microsoft Excel Function Reference*
Data tables	"Projecting Figures Using a Data Table" in Chapter 7
Linking worksheets	"Linking Documents" in Chapter 8
Custom number formats	"Entering Worksheet Data" in Chapter 3
Worksheet buttons	Chapter 18, "Automating Tasks with Command Macros"
Writing macros	Chapter 18, "Automating Tasks with Command Macros," and Chapter 19, "Designing and Writing a Command Macro"

Using the Add-in Macros

The Microsoft Excel library contains 18 add-in macros that can help you perform common tasks, such as automatically saving your worksheet as you work or checking the integrity of your model. In this section, specific descriptions of the add-in macros are arranged in the order listed in the following table. For more information on designing your own macros, see Part 6, "Customizing and Automating," of this book. The add-in macros included in the Microsoft Excel library are listed in the following table:

Add-in macro filename	Description
Add-in Functions	Provides six additional worksheet functions: BASE, DEGREES, FASTMATCH, RADIANS, RANDBETWEEN, and SUMSQUARES.
File Functions	Provides four macro functions for creating, deleting, and getting information about folders.
Add-in Manager	Swaps add-in macros into and out of Microsoft Excel and opens a specified set of add-in macros whenever you start Microsoft Excel.
Auto Save	Saves documents automatically as you work.
Document Summary	Stores the author, title, comments, and creation date with a worksheet or macro sheet.
Flat File	Imports data from a text file to a worksheet and exports data from a worksheet to a text file.
Glossary	Saves frequently used formulas or data for pasting into a worksheet or macro sheet.
Macro Debugger	Tracks down bugs in your macros.
Multiple Sheet Aide	Helps you navigate through multiple worksheets.
Name Changer	Changes or deletes names.
Slide Show	Creates a slide show from Microsoft Excel worksheets and charts.
Structured Macro Template	Provides a structured template for writing macros; includes two tools for writing macros.
What If	Cycles worksheet model through different scenarios.
Worksheet Auditor	Tracks down worksheet errors.
Worksheet Comparison	Compares two worksheets.
Alternate Startup Folder*	Specifies a startup folder in addition to the Excel Startup Folder.
Sound Notes*	Provides a way to record, play, select, copy, and delete sounds in worksheet and macro sheet cells.
Standard File Dialogs*	Creates custom File Open and File Save dialog boxes to provide the full pathname of files that are opened and saved.

* These add-in macros are described in online Help. For more information on these macros, select the Macro Library topic in the Help Index.

Add-in Functions

The Add-in Functions macro sheet contains six functions in addition to those built into Microsoft Excel. You can use these functions on any worksheet or macro sheet.

- **BASE(*number,target_base,precision*)** Converts a number from base 10 to another base.
- **DEGREES(*angle_in_radians*)** Converts from radians to degrees.
- **FASTMATCH(*lookup_value,lookup_array,type_of_match*)** Similar to the built-in function MATCH, but faster on large lookup arrays.
- **RADIANS(*angle_in_degrees*)** Converts from degrees to radians.
- **RANDBETWEEN(*bottom,top*)** Returns a random integer within an interval.
- **SUMSQUARES(*reference*)** Returns the sum of squares.

Before you can use these add-in functions, make sure the Add-in Functions macro sheet is open. To find out whether it is open, choose the Formula Paste Function command. If the add-in function BASE is in the list, the macro sheet is open. If BASE is not in the list, open the file named Add-in Functions.

Once the Add-in Functions macro sheet is open, you can use the add-in functions just as you would any built-in Microsoft Excel function. You need not specify the macro sheet name when referring to the functions.

For information on writing your own add-in functions, see Chapter 17, "Creating and Using Custom Worksheet Functions," and Chapter 20, "Creating a Custom Application."

In the following functions, required arguments are shown in bold; optional arguments are not bold.

BASE(number,*target_base,precision*)

Returns, as text, the equivalent of a base-10 number in another base.

- ***Number*** is a base-10 number.
- ***Target_base*** is the base you want to convert the number into. It must be an integer between 2 and 36. If *base* is omitted, BASE returns a base-16 number.
- ***Precision*** specifies the number of digits you want after the decimal in the returned base. It must be a positive integer. If *precision* is omitted, it is assumed to be 0, and BASE returns an integer.

DEGREES(*angle_in_radians*)

Converts radians into degrees.

- ***Angle_in_radians*** is an angle in radians.

FASTMATCH(lookup_value,lookup_array,*type_of_match*)

Returns the relative position of an element in an array that matches the specified value. Use FASTMATCH instead of the built-in function MATCH when you need to search large sorted arrays.

- ***Lookup_value*** is the value you're searching for within *lookup_array*.
- ***Lookup_array*** is an array or a range of cells containing possible lookup values.
- ***Type_of_match*** is either 1 or –1. *Type_of_match* specifies how FASTMATCH matches *lookup_value* with values in *lookup_array*.
  - If *type_of_match* is 1, FASTMATCH finds the largest value that is less than or equal to *lookup_value*. *Lookup_array* must be in ascending order: ..., 2, 1, 0, 1, 2, ..., A–Z, FALSE, TRUE, and so on.
  - If *type_of_match* is –1, FASTMATCH finds the smallest value that is greater than or equal to *lookup_value*. *Lookup_array* must be in descending order: TRUE, FALSE, Z–A, ..., 2, 1, 0, –1, –2, ..., and so on.
  - If *type_of_match* is omitted, it is assumed to be 1.

Like MATCH, FASTMATCH does not distinguish between uppercase and lowercase letters in making matches.

Unlike MATCH, FASTMATCH requires the values in *lookup_array* to be in sorted order. That is, FASTMATCH will not work if *type_of_match* is 0. It returns the error value #VALUE! if *type_of_match* is not –1 or 1. This is because FASTMATCH uses a binary search algorithm instead of the slower sequential algorithm used by MATCH.

For examples of how to use FASTMATCH, see the MATCH function in the *Microsoft Excel Function Reference*.

RADIANS(angle_in_degrees)

Converts degrees into radians.

- ***Angle_in_degrees*** is an angle in degrees.

RANDBETWEEN(bottom,top)

Returns a random integer within a given range.

- ***Bottom*** is the smallest integer RANDBETWEEN will return.
- ***Top*** is the largest integer RANDBETWEEN will return.

SUMSQUARES(reference)

Returns the sum of the squares of all the numbers in a range.

- ***Reference*** is an array or a range of cells.

Like SUM and SUMPRODUCT, SUMSQUARES ignores any logical values or text in *reference*.

File Functions

With the File Functions macro, you can use four additional macro functions to create, delete and get information about folders.

CREATE.DIRECTORY(path_text)

Creates a directory relative to the current folder.

- ***Path_text*** is the name of the folder you want created inside the current folder, or the path location and name for the new folder.

The following macro formula creates a folder named "August Sales" in the current folder:

CREATE.DIRECTORY("August Sales")

The following macro formula creates a folder named "August Sales" in the folder Hard Disk:Word:Reports

CREATE.DIRECTORY("Hard Disk:Word:Reports:August Sales")

DELETE.DIRECTORY(path_text)

Deletes an empty folder. If the specified folder is not empty, DELETE.DIRECTORY returns FALSE.

- ***Path_text*** is the name of the folder in the current folder or the pathname of the folder you want to delete.

The following macro formula deletes the empty August Sales folder from the current folder:

DELETE.DIRECTORY("August Sales")

The following macro formula deletes the empty August Sales folder from the folder Hard Disk:Word:Reports:

DELETE.DIRECTORY("Hard Disk:Word:Reports:August Sales")

FILE.EXISTS(path_text)

Tests for the existence of a file or folder. Returns TRUE if the file or folder exists; FALSE otherwise.

- ***Path_text*** is the name of the file or folder you wish to find. If the file or folder is not in the current folder, you must give the full path.

The following macro formula tests for the existence of a file named Sales Template in the current folder:

FILE.EXISTS("Sales Template")

The following macro formula tests for the existence of a file named Sales Template in the folder Hard Disk:Word:Reports:

FILE.EXISTS("Hard Disk:Word:Reports:Sales Template")

The following macro formula tests for the existence of the folder named Hard Disk:Word:Reports:

FILE.EXISTS("Hard Disk:Word:Reports")

DIRECTORIES(path_text)

Returns a horizontal array of all of the subfolders in the current folder or specifed path.

- ***Path_text*** is the folder from which you want to return a list of subfolders. If *path_text* is omitted, DIRECTORIES returns a list of the subfolders inside the current folder.

The following macro formula returns an array of the folders in the current folder:

DIRECTORIES()

The following macro formula returns an array of the folders in the folder Hard Disk:Word:Sales:

DIRECTORIES("Hard Disk:Word:Sales")

The following macro formula defines the name Paths to refer to the subfolders in Hard Disk:Word:Sales:

SET.NAME("Paths",DIRECTORIES("Hard Disk:Word:Sales")

Add-in Manager

With the Add-in Manager macro, you can specify a *working set* of add-in macros to be automatically opened whenever you run the Add-in Manager. By placing the Add-in Manager in your startup folder, you can specify a set of add-in macros that will be automatically opened whenever you start Microsoft Excel.

There are two steps to using the Add-in Manager: adding add-in macros to the Add-in Manager's working set and running the Add-in Manager whenever you start Microsoft Excel.

Adding an add-in macro to the working set

1. Open the Add-in Manager macro sheet.
2. Choose Options Add-Ins.

   The Add-in Manager displays a dialog box listing all the add-in macros in its working set.
3. Choose the Add button.

   The Add-in Manager displays the standard File Open dialog box.

4. In the Files box, select the first add-in macro you want to add to the working set.
5. Choose the Open button.

   The Add-in Manager opens the add-in macro you specify and adds it to the working set. Each add-in macro in the working set is opened whenever the Add-in Manager is run.
6. Repeat steps 3 through 5 for every add-in macro you want to add to the working set.
7. When you have finished adding add-in macros, choose the Close button to save your changes and close the dialog box.

NOTE In addition to add-in macros, you can add worksheets to the working set of files that will be opened along with the Add-in Manager. This could be used, for example, to automatically open a worksheet containing commonly used lookup tables.

Removing an add-in macro from the working set

1. Open the Add-in Manager macro sheet.
2. Choose Options Add-Ins.

   The Add-in Manager displays a dialog box listing all the add-in macros in its working set.
3. In the Add-Ins Installed box, select the add-in macro you want to remove from the working set.
4. Choose the Remove button.
5. Choose OK to confirm your choice.

   The Add-in Manager closes the specified add-in macro and removes it from the working set.
6. Repeat steps 3 through 5 for each add-in macro you want to remove from the working set.
7. When you have finished removing add-in macros, choose the Close button to save your changes and close the dialog box.

If you want the Add-in Manager—and the add-in macros in your working set—to be opened every time you start Microsoft Excel, put the Add-in Manager in your startup folder. To do this, move the Add-in Manager macro sheet from the Library folder into a subfolder named Excel Startup Folder within your Microsoft Excel System folder.

For more information on the Excel Startup folder, see "Specifying a Startup Folder and Document," in Chapter 16.

Changing the folder an add-in macro is opened from

You can change the folder an add-in macro is opened from.

1 Open the Add-in Manager macro sheet.

2 Choose Options Add-Ins.

3 Select the add-in macro you want to open from a different folder.

4 Choose the Edit button.

5 To open the file from the same folder as the add-in manager, select the Same Folder As The Add-In Manager option.

To specify the path from which you want the file opened, select the Path option and type the path.

Changing the read-only status of an add-in macro

1 Open the Add-in Manager macro sheet.

2 Choose Options Add-Ins.

3 Select the add-in macro you want to change the read-only status of.

4 Choose the Edit button.

5 To specify read-only status, turn on the Open As Read-Only check box.

To remove read-only status, turn off the Open As Read Only check box.

Auto Save

The Auto Save add-in macro helps you prevent data loss by automatically saving your documents as you work.

Automatically saving your work

1 Open the Auto Save macro sheet.

2 Choose Options AutoSave.

3 Select one of the four options for saving your files:

The High option saves your documents approximately every 3 minutes.

The Medium option saves your documents approximately every 9 minutes.

The Low option saves your documents approximately every 30 minutes.

The Never option turns off automatic saving.

4 If you want Auto Save to notify you before saving a document, turn on the Prompt Before Saving check box.

5 If you want Auto Save to save all open Microsoft Excel documents at each automatic save, turn on the Save All Files check box. Otherwise, Auto Save saves only the active document at each save.

6 Choose OK.

Unless you specified the Never option, Auto Save displays a check mark next to the AutoSave command on the Options menu and saves your documents automatically as you work.

Document Summary

With the Document Summary macro, you can record information about a particular worksheet—such as the worksheet's title, author, and creation date—right along with the worksheet itself. This can be especially useful if several people work on the same worksheet. By recording information about changes, you can track the current status of the worksheet.

Recording and viewing summary information

1 Open the Document Summary macro sheet.

2 Choose Edit Summary Info.

The macro displays a dialog box which summarizes the information about the active worksheet.

3 Change any of the information you want.

You cannot change the date the document was created.

4 Choose OK.

The Document Summary macro stores the summary information as hidden names on the worksheet. The information is saved along with the worksheet.

For information on hidden names, see "Naming Cells and Formulas," in Chapter 6.

Flat File

The Flat File macro helps you import or export data between "flat" text files—files in which data is not separated by tabs—and cell ranges on a worksheet. The macro provides two commands:

Data Export Exports a group of selected cells to a text file. You can decide whether to keep the cells' alignment and number formats.

Data Smart Parse Distributes text values in a single column to fill several columns. Unlike the built-in Data Parse command in Microsoft Excel, Data Smart Parse treats each row independently, placing each logical word into its own cell.

Exporting cells to a text file

1 Open the Flat File macro sheet.

2 Select the cells you want to export. This must be a contiguous selection.

3 Choose Data Export.

4 In the To File Name box, type the name of the text file you want to create.

5 If you want the exported text file to reflect the alignment and number formats of the selected cells, turn on the Retain Cell Formats check box. The macro inserts one extra space between columns.

If you want the exported text file to reflect General alignment and number format options, turn off the Retain Cell Formats check box. No extra spaces are inserted between columns.

6 Choose the Export button.

The Flat File add-in macro creates a text file that contains the data in the selected cells.

Parsing text values

1 Open the Flat File macro sheet.

2 Select the cell range to parse. Your selection can contain only one column, but it can contain as many rows as you want.

3 Choose Data Smart Parse.

4 Select the option for the column delimiter you want.

5 To include extra blank spaces, turn off the Remove Extra Blank Spaces check box.

6 Choose OK.

The Flat File macro parses each cell in your selection containing text. It places each group of characters that is separated by one or more spaces into a separate cell.

Glossary

With the Glossary add-in macro, you can save frequently used formulas and the contents of cells in a "scrapbook" manner.

You create a glossary entry by adding a cell or a group of cells to the glossary. Later, you can insert any glossary entry into a worksheet. Glossary entries remain in the glossary until you delete them.

Adding a glossary entry

1 Open the Glossary macro sheet.

2 Select the cell or cells whose contents you want to make a glossary entry.

3 Choose Edit Glossary.

4 In the Name box, type the name of the new entry.

5 Choose the Define button.

The Glossary macro creates a new glossary entry with the specified name. You can continue adding glossary entries by typing a name in the Name box and cell reference in the Refers To box, or you can close the dialog box by choosing the Close button.

Inserting a glossary entry into the active sheet

1 Open the Glossary macro sheet.

2 Select the cell or cells in which you want to insert the glossary entry.

If your selection is not the same size as the glossary entry, the active cell is the upper-left corner of the area in which the glossary entry is inserted.

3 Choose Edit Glossary.

4 In the Glossary Entries box, select the glossary entry you want to insert into the active sheet.

5 Choose the Insert button.

The Glossary add-in macro inserts the glossary entry into your sheet.

Deleting a glossary entry

1 Open the Glossary macro sheet.

2 Choose Edit Glossary.

3 In the Glossary Entries box, select the glossary entry you want to delete.

4 Choose the Delete button.

5 Choose OK to confirm the deletion.

The glossary entry is deleted.

Repeat steps 3 through 5 for each glossary entry you want to delete.

When you have finished deleting glossary entries, choose Cancel to save your changes and close the dialog box.

Macro Debugger

The Macro Debugger add-in macro builds an environment within Microsoft Excel in which you can easily debug and run your macros. In the debugging session, you can set *tracepoints* and *breakpoints* at key cells in the macro you're debugging. When you run the Macro Debugger, the macro:

- Pauses at all tracepoints and enters single-step mode. You can interactively trace the macro, continue execution, or halt the macro.
- Pauses at all breakpoints, displaying the values of a group of cells and names you specify in advance. You can choose to continue running the macro, enter single-step mode, or halt the macro.

Tracepoints and breakpoints are known collectively as *debug points*.

IMPORTANT **To be safe, save the macro sheet you're testing before starting the debugging session. It is possible, although unlikely, that a macro being tested could interfere with the debugging session and prevent the Macro Debugger from properly restoring the macro sheet at the end of the debugging session.**

Before you begin debugging a macro, you should be aware of these guidelines:

- Setting a debug point at a cell on your macro sheet temporarily changes the formula in that cell, although it does not alter the value that results from calculating the formula. When you quit the debugging session, all debug points are removed and your formulas are restored.
- You can edit cells and switch between windows as usual while in the debugging session. However, you can't change the formula in a cell containing a debug point.
- You must turn off document protection for your macro sheet before you start the debugging session. Starting the debugging session changes the cell protection status set and turns on document protection on your macro sheet. When you quit the debugging session, all the macro sheet cells are locked.

Starting a debugging session

1. Open the Macro Debugger macro sheet.
2. Switch to the macro sheet to be tested.
3. Choose Macro Debug.

   The Macro Debugger macro starts the debugging session and displays the debugging menu bar. Before you run a macro in the debugging session, you should set debug points.

Setting tracepoints in the debugging session

1. Select the cell before which you want to set the tracepoint.
2. Choose Debug Set Trace Point.

Setting breakpoints in the debugging session

1. Select the cell before which you want to set the breakpoint.
2. Choose Debug Set Breakpoint.
3. If you want, type a breakpoint message. This message will be displayed whenever the breakpoint is encountered.
4. Choose OK.

Specifying variables to be displayed at breakpoints

When you set breakpoints in your macro, you need to specify the cells and names you want the Macro Debugger to display at each breakpoint.

1. Choose Debug Breakpoint Output.
2. To add a variable, type the reference or name and choose OK. Or, you can choose the Add button to add the output variable and keep the dialog box displayed so you can add another output variable.
3. To remove a variable, select the variable in the list and choose the Delete button.

Removing a debug point

1. Select the cell where the tracepoint or breakpoint is located.
2. Choose Debug Erase Debug Point.

Running a macro

After you have set debug points and specified the variables to be displayed at all breakpoints, you are ready to run your macro.

1. Choose Debug Run Macro.
2. In the Run box, select the macro name, or type the name or reference of the macro in the Reference box.
3. Choose OK.

   The macro runs as usual, except that it carries out special commands at debug points. These commands do not affect the result of the macro. When a breakpoint is encountered, the breakpoint dialog box appears, showing that breakpoint's message and the values of the variables you specified with the Debug Breakpoint Output command.
4. In the breakpoint message dialog box, choose the Continue button to continue running the macro, the Step button to step through the macro, or the Halt button to stop the macro. If you choose the Step button, ignore the last step you encounter; it is the RETURN function from the breakpoint routine.

   When a tracepoint is encountered, the Step dialog box appears so you can step through the macro. For information on stepping through a macro, see "Testing a Command Macro," in Chapter 19.

NOTE If you are debugging a macro that switches from the debug menu bar to another menu bar, you can restore the debug menu bar by pressing COMMAND+OPTION+SHIFT+R

In addition to controlling the running of the macro by setting and removing debug points, the Macro Debugger provides some secondary commands:

- **Formula Hidden Names** Shows the values of hidden names on the active sheet. For information on hidden names, see "Naming Cells and Formulas" in Chapter 6.
- **Formula Note** Is the same as the normal Formula Note command. For information, see "Adding Comments to a Worksheet" in Chapter 6.
- **Formula Goto** Is the same as the regular Formula Goto command. For information, see "Selecting Cells and Moving Around the Worksheet" in Chapter 3.
- **Formula Find** Is the same as the regular Formula Find command. For information, see "Finding and Replacing Cells and Data" in Chapter 4.
- **Formula Select Debug Points** Selects all the cells on your macro sheet with breakpoints or tracepoints.
- **Formula Select Errors** Selects all cells with formulas that evaluate to errors.
- **Display Formulas/Values** Switches the macro sheet between displaying formulas and values.
- **Display Arrange All** Is the same as the normal Window Arrange All command. For information, see "Working with Windows" in Chapter 1.
- **Display Show Info** Is the same as the normal Window Show Info command. For information, see "Auditing a Worksheet" in Chapter 6.

Quitting the debugging session

▶ Choose Debug Exit Debug.

The Macro Debugger macro restores the previous menu bar, removes the debug points, and turns off document protection on your macro sheet.

Multiple Sheet Aide

The Multiple Sheet Aide macro includes two features that will help you navigate through your documents, especially if you frequently open several worksheets, charts, and macro sheets at one time.

- The Window Arrange All Horizontal command arranges the unhidden windows horizontally across the screen. This command can be useful when you want to view parts of several worksheets simultaneously and the areas you want to see are wider than they are high.
- The Move Down key traces references to other worksheets and macro sheets. This command is useful when you want to check external references on a worksheet.

Arranging the open windows horizontally

1 Open Multiple Sheet Aide.

2 Choose Window Arrange All Horizontal.

The macro tiles the open documents horizontally on the screen.

Tracing references to other documents

1 Open Multiple Sheet Aide.

2 Select a cell containing a reference to another worksheet or macro sheet. The cell must contain only one external reference, and the reference must be to a single contiguous area.

3 Press COMMAND+OPTION+D.

If the supporting document is open, the Multiple Sheet Aide switches to it and selects the range referred to.

If the supporting document is not open, the Multiple Sheet Aide asks if you want to open it. If you choose OK, it opens the document and selects the range referred to.

4 When you are finished examining the supporting document and want to return to the original cell, press COMMAND+OPTION+SHIFT+D.

The Multiple Sheet Aide switches back to the original sheet and selects the original cell.

Name Changer

With the Name Changer add-in macro, you can quickly change a name on a worksheet. In addition to changing the definition of the name, the macro replaces every occurrence of the old name in the worksheet with the new name. Name Changer can also help you delete a name from one of your worksheets. Unlike the Delete button in the Formula Define Names dialog box, Name Changer alerts you before deleting a name that is in use on your worksheet.

Changing a name

1 Open Name Changer.

2 Choose Formula Change Name.

3 In the From box, select the name to change.

4 In the To box, type the new name.

5 Choose the Rename button.

Name Changer changes the definition of the name and replaces every occurrence of the name on the worksheet.

6 Repeat steps 3 through 5 for every name you want to change.

7 When you have finished changing names, choose the Close button to save your changes and close the dialog box.

Deleting a name

1 Open Name Changer.

2 Choose Formula Change Name.

3 In the From box, select the name you want to delete.

4 Choose the Delete button.

If the name you have selected is referred to on the worksheet, Name Changer asks you to confirm the deletion. Choose OK to confirm the deletion.

5 Repeat steps 3 and 4 for every name you want to delete.

6 When you have finished deleting names, choose the Close button to save your changes and close the dialog box.

Slide Show

With the Slide Show add-in macro, you can create an automatic "slide show" out of a set of Microsoft Excel charts and worksheets. After you open all the documents making up the slide show and specify how to cycle through them, the macro advances to each "slide" in order.

Running a slide show

1 Open Slide Show.

2 Open all the documents to be included in the slide show. Close or hide any documents that are not to be included in the slide show.

3 Choose Macro Slide Show.

4 If you want the Slide Show macro to automatically advance each slide after it has been displayed for a certain interval, select the Automatically option. In the Advance Every ... Seconds box, type the number of seconds you want each slide displayed.

If you want to press TAB to advance to each slide, select the Manually option. The number in the Advance Every ... Seconds box is ignored.

5 If you want the slide show to end after every slide has been shown once, select the Show All The Open Documents Once option.

If you want the slide show to cycle through all the slides repeatedly until you interrupt it, select the Keep Showing The Open Documents option.

6 If you want the Slide Show macro to hide the Microsoft Excel menu bar, tool bar, and formula bar while the slide show is running, turn on the Hide Menus, Tool Bar & Formula Bar check box. Otherwise, turn off the check box.

7 Choose the Run button.

The Slide Show macro runs the slide show as you specified, advancing through all the open windows in the same order as if you repeatedly pressed COMMAND+F6.

Interrupting a running slide show

You can interrupt a running slide show and return to the regular Microsoft Excel environment. You can interrupt a slide show whether it is advanced manually or automatically.

▶ Press Q.

The Slide Show macro stops the slide show. If you specified Hide Menus when you started the slide show, the macro restores the Microsoft Excel menu bar, tool bar, and formula bar.

Structured Macro Template

The macro sheet template named Structured Macro Template can help you rapidly develop sophisticated macro applications in three ways:

- Because it is formatted in an easy-to-read manner, the template helps you to organize your macros as you develop them. Each column is labeled in the first row; all you have to do is fill in the functions in the appropriate places.
- Because it contains ready-made auto-open and auto-close macros, the template saves you from writing these common macros over and over again.
- Because it contains two utility macros—Indent and CommandWindow—the template helps you to rapidly debug your macros. Just delete these macros when you finish your application.

Automatically indenting macro commands

The Indent utility macro can add or remove indentations from your macro commands.

To automatically indent selected macro commands and make them more visible:

1 Select the cells on the macro sheet containing the commands you want to indent.

2 Press COMMAND+OPTION+N.

The Indent macro indents the following control structures: block IF statements, FOR loops, FOR.CELL loops, and WHILE loops. The Indent macro only indents control structures that begin within the selection.

Each level is indented three spaces beyond the previous level.

Removing macro indenting

1 Select the cells on the macro sheet containing the commands from which you want to remove the indents.

2 Press COMMAND+OPTION+M.

In each of the selected cells, the Indent macro removes all the spaces between the equal sign and the first letter of the function.

Using the command window

With the CommandWindow utility, you can immediately calculate a macro function by typing the function into a dialog box or clicking the cell that contains the function.

1 Press COMMAND+OPTION+SHIFT+C.

2 Type the macro function just as you would enter it in a cell or click the cell that contains the function.

3 Choose OK.

The CommandWindow macro calculates the function and displays the result.

4 Choose the Close button.

What If

The What If macro can quickly cycle a worksheet model through several scenarios by supplying a succession of input values to one or more input cells.

For example, suppose you have a worksheet with calculations that depend on an interest rate and a down payment amount, and you want to calculate three different interest rates—say, 6 percent, 7.5 percent and 9 percent—and two different down payment amounts—say, $10,000 and $25,000. The What If macro can rapidly cycle through all the different combinations of interest rates and down payments.

To set up the What If macro, you need to tell the macro which data sheet to use with the model worksheet. The data sheet contains the values to be substituted into each input cell. You can create a new data sheet or specify an existing one. Once you have specified the data sheet for a model worksheet, the two will be associated until you close the model or specify another data sheet.

Creating a new data sheet

Create a new data sheet when you haven't saved a previous data sheet or when you want to create new independent variables or values.

1 Open What If.

2 Switch to the model worksheet.

3 Choose Formula What If.

4 Choose the New button.

5 Enter the name or reference of the first independent variable and choose OK.

In the preceding example, you would enter a reference to the cell containing the interest rate.

6 Type each possible value for the first variable and choose OK for each.

In the example, you would type **6%**, choose OK, type **7.5%**, choose OK, type **9%**, and choose OK.

7 When you have entered all the values for the first variable, choose the Done button.

8 Repeat steps 5 through 7 for each additional independent variable.

In the example, you would repeat steps 5 through 7 for the down payment amount.

9 When you have entered all the values for the last variable, choose the Done button to save your changes and close the dialog box.

Specifying an existing data sheet

Specify an existing data sheet only if you have previously created and saved a data sheet for your model.

1 Open What If.

2 Open the existing data sheet.

3 Switch to the model worksheet.

4 Choose Formula What If.

5 In the Data Sheet box, select the data sheet.

6 Choose OK.

After the what-if model has been set up, there are two ways to cycle through the variables: advancing the variables all at once or advancing one variable at a time.

Calculating all possible input values at once

Advance the variables all at once when you want to cycle through all possible scenarios for your model.

1 Switch to the worksheet.

2 Press COMMAND+OPTION+SHIFT+T.

The What If macro uses the next value for each independent variable and recalculates the worksheet. The cycling of the variables is similar to that of a counter.

Advancing one variable at a time

Advance one variable at a time when you want to cycle through the values of only that variable, leaving the values of the other variables unchanged.

1 Switch to the model worksheet.

2 Select the input cell to be calculated.

3 Press COMMAND+OPTION+T.

The What If macro uses the next value for the selected variable in the input cell and recalculates the worksheet.

Worksheet Auditor

The Worksheet Auditor add-in macro can help you check the structure of your worksheets and analyze the layout and formulas.

Worksheet Auditor provides four tools:

- **Audit** Generates a report of potential errors on your worksheet.
- **Map** Creates a map of your worksheet to help you get a better idea of its contents.
- **Interactive Trace** Helps you to see cell dependencies on your worksheet and understand your data flow.
- **Worksheet Info** Displays some otherwise hard-to-get information about your worksheet.

Generating an audit report

1 Open Worksheet Auditor.

2 Choose Formula Worksheet Auditor.

3 Select the Generate Audit Report option.

4 Choose OK.

5 Turn off the check boxes for the types of auditing you don't want to include in the report:

Errors includes cells with error values.

References To Blanks includes formulas that refer to blank cells.

References To Text includes formulas that refer to cells containing text.

Circular References includes all cells that are part of circular references.

Names includes suspicious or potentially unused worksheet names.

6 Choose OK.

The Worksheet Auditor macro produces a report of the cells and names you specified on your worksheet.

Mapping your worksheet

1 Open Worksheet Auditor.

2 Choose Formula Worksheet Auditor.

3 Select the Map Worksheet option.

4 Choose OK.

The Worksheet Auditor macro creates a map of the cells on your model worksheet.

Tracing cell dependencies

1 Open Worksheet Auditor.

2 Choose Formula Worksheet Auditor.

3 Select the Interactive Trace option.

4 Choose OK.

Worksheet Auditor displays two windows on the screen: at the right is your worksheet; at the upper left is the Info window with the Interactive Trace control panel.

5 In the Interactive Trace control panel, choose the following buttons as needed until you have completed the trace:

To select all the dependents or precedents of the active cell, choose the Find Dependents or Find Precedents button.

To change the active cell, choose the Reset Active Cell button.

To retrace the steps you've already made, choose the Back or Forward button.

To quit the interactive trace, choose the Exit Trace button.

The Worksheet Auditor macro restores the previous workspace.

Getting information about your worksheet

1 Open Worksheet Auditor.

2 Choose Formula Worksheet Auditor.

3 Select the Worksheet Information option.

4 Choose OK.

The Worksheet Auditor macro displays a report about your worksheet.

For information on auditing your worksheet with the built-in auditing tools in Microsoft Excel, see "Auditing a Worksheet" in Chapter 6.

Worksheet Comparison

The Worksheet Comparison add-in macro compares two worksheets and generates a report of the differences between them. Use this macro when you have two versions of a worksheet and you want to see what has been changed in the newer one.

Comparing two worksheets

1 Open Worksheet Comparison.
2 Open the two worksheets you want to compare.
3 Switch to one of the two sheets.
4 Choose Formula Compare.
5 In the Compare To Sheet box, select the other worksheet.
6 Choose OK.

The Worksheet Comparison macro generates a report listing any differences found between the two worksheets.

MORE ABOUT

More About Using the Add-in Macros

Tips

Opening Add-in Macros with Microsoft Excel There are two ways to open an add-in macro automatically every time you start Microsoft Excel:

- **Copy the add-in macro to your startup folder** Microsoft Excel opens all the files in the Excel Startup Folder when it is started. For more information on the startup folder, see "Specifying a Startup Folder and Document," in Chapter 16.
- **Copy only the Add-in Manager add-in macro to your startup folder** Microsoft Excel will open the Add-in Manager add-in macro when it is started, and the Add-in Manager in turn opens a working set of add-in macros. Although this method takes longer when you start Microsoft Excel, it gives you flexibility to move add-in macros into or out of your working set as you work.

  For more information on the Add-in Manager, see "Add-in Manager," earlier in this section.

Examining the Add-in Macros to See How They Work Because the add-in macros in the Microsoft Excel library are saved as add-in files, Microsoft Excel hides them to keep them out of your way while you work. However, if you want to examine any of the add-in macros in the library, hold down SHIFT when you choose the Open button in the File Open dialog box. Then choose the Window Unhide command, select the add-in macro sheet you want to view, and choose OK. The add-in macro sheet will be opened as a regular macro sheet, and its auto-open macro will not be run.

For more information on add-in files, see "Creating Add-in Functions and Command Macros" in Chapter 20.

Creating Your Own Models

A *model* is a set of Microsoft Excel worksheets and macro sheet designed to solve a particular problem. An example of a model is the Sales Tracking model described earlier in this appendix.

In most situations, it isn't enough to get a Microsoft Excel model to generate numbers. Your model should meet three design criteria:

- **Guaranteed correctness** If you can't guarantee that your model always yields the right answers, it isn't effective. Design your model to make errors immediately apparent.
- **Adaptability** Most likely, the task you want your model to perform won't remain the same forever. Design the model so that it can be easily modified, by you and by someone else.
- **Speed** Although speed is less important than accuracy, you should try to design your model efficiently to speed recalculation.

Following some simple guidelines can help your models meet all three criteria. This section discusses the most basic guidelines; the following section, "For More Information," lists references for in-depth information on model design.

Use a Vertical, Modular Design

Organize your worksheets vertically. Use only one or two screens of columns, but use as many rows as you need. A strict vertical scheme promotes a clearer flow of calculation and provides the fastest recalculation possible.

Break your worksheet into manageable sections, each a horizontal slice of the overall vertical worksheet. Each section should serve a single purpose in your model. If you divide your model most effectively, each section should be as wide as the entire worksheet and no more than one or two screens high. You should clearly distinguish each section from adjoining sections by using cell formatting, colors, or cell borders.

Every formula in your worksheet should refer only to cells above it. As a result, your calculations should proceed strictly downward, from raw data near the top of your worksheet to final results at the bottom. This worksheet design is the most efficient for Microsoft Excel to recalculate.

No critical assumptions should be buried in formulas in the middle of the worksheet. Instead, all the assumptions should be clearly documented in a special assumptions section, which serves two purposes:

- Everyone who looks at your worksheet will understand how you arrived at your results, and you will better understand any inherent limits in your calculations.
- You'll create a model that is highly adaptable, because key assumptions can be changed easily—which could save you or someone else a lot of time later.

Use a Standard Layout

Using the standard worksheet layout described in the following sections will speed recalculation and make your model easier to maintain. You can adapt this template to your own models.

- **Title/instructions/contents** This section includes critical documentation about the rest of the worksheet: the model's title, purpose, and author; a list of other worksheets or macro sheets that must be opened for the model to work; instructions to the user; and a table of contents that outlines the order of the sections in the worksheet. There are no calculations in this section.
- **Assumptions** This section contains any initial assumptions that you might otherwise include in worksheet formulas. For example, if you are assuming a commission rate of 20 percent, put it in this section, label it, and refer to it later.
- **Data** This section includes the raw data for your model—such as records of transactions from which your model will calculate trends. If your model needs a great deal of raw data, you should move this section into a separate linked worksheet to reduce clutter and speed your calculations.
- **Calculations** Include as many sections as you need to process your data. Each section should be based only on the results from previous sections, so that the model's calculation progresses down the worksheet.

  Break your task into manageable chunks. Divide the job of your worksheet into a series of calculation steps, and then plan one section on your worksheet for each step in your task. As you design each section, give it a clear purpose—for example, "this section refers to the database on the supporting worksheet and summarizes sales for a single month."
- **Final results** The last section on your worksheet should contain the last calculations needed to arrive at the answers. Along with the assumptions section, this section should provide a comprehensive summary of your model's calculations.

Write Clear Formulas

Writing clear formulas reduces calculation errors, makes your model easy to maintain, and speeds recalculation by eliminating unnecessary computations. There are three keys to writing clear formulas:

- Divide complex calculations into several cells instead of trying to pack them into single formulas. This will make your model easier to understand and help you catch intermediate errors.
- Whenever the meaning of a number could be misinterpreted, explain the number by using a text label in an adjacent cell. For example, if cell D140 contains a formula that calculates pretax revenue exclusive of interest income, enter this information in cell E140.

- Always document how your formulas work. In doing so, you should address the needs of two groups of people: users who use your model daily to solve problems, and other Microsoft Excel developers who need to modify your model.

  Because they need to understand what the numbers in a model mean, users need to understand, in general terms, how a formula arrives at its answer. Use descriptive cell names in your formulas instead of cell references; "=Income–Expenses" is a clearer description of "Profit" than "=$F$31–$F$56". The Formula Create Names and Formula Apply Names commands can make this task easy. For more information, see "Naming Cells and Formulas" in Chapter 6.

  Typically, Microsoft Excel developers need more information about formulas than day-to-day users do. For this audience, you should use cell notes to explain your calculations. Microsoft Excel keeps this additional information out of the way of the daily user, but available to anyone who needs it. For more information on cell notes, see "Adding Comments to a Worksheet" in Chapter 6.

Make the Model Easy to Use

You can speed up your users' task by designing your Microsoft Excel model to be easy to use. Follow these guidelines:

- Provide clear instructions to the user by using text boxes, justified or wrapped text, and graphic objects. Always provide a brief set of instructions in the title/instructions/contents section at the top of every worksheet.
- If your users have color monitors, use color on your worksheet to indicate which values the user can change. Then, for example, tell users in the instructions section that they can change anything that appears in blue.
- Use cell protection to prevent users from changing critical cells.
- Turn off the display of gridlines and/or row and column headings to make the display clearer.
- Automate common operations using the macro recorder and assign the macros to buttons on the worksheet. For example, instead of making your users repeatedly select a range of cells and navigate the "Data Sort" dialog box, create a button named "Sort" on your worksheet and assign to it a macro that does the task for them.

MORE ABOUT

More About Creating Your Own Models

Tips

Creating a Worksheet Template If you design worksheets frequently, you should create a worksheet template with standard headers for the various sections: Title, Assumptions, Calculations, and so on. Save the template in your Microsoft Excel startup folder, and its name will appear in the File New dialog box. You can also change defaults in this template, such as turning off gridlines and using different fonts. For more information on creating templates, see "Creating and Using a Document Template" in Chapter 16.

Adding Embedded Charts To simplify creating presentation-quality reports from your worksheets, you can use embedded charts to display graphical interpretations of your results. Typically, embedded charts should be placed just above the values they refer to in the worksheet—that way, the picture comes before the numbers. This is an exception to the rule of top-to-bottom calculation flow, because the chart itself will refer to cells below it. For more information on using embedded charts, see "Creating a New Chart" in Chapter 11.

Creating Your Own Macros For information on designing and writing macros, see Part 6, "Customizing and Automating," in this book.

For More Information

For detailed information on spreadsheet design, see the following book:

Nevison, John M. *Microsoft Excel Spreadsheet Design*. New York, NY: Simon and Schuster, 1990.

For additional information on spreadsheet design, writing macros, and designing applications, see the following books:

Alves, Jeffrey R., Bill Fletcher, and Dennis P. Curtin. *Planning and Budgeting with Excel*. Berkeley, CA: Osborne McGraw-Hill, 1986.

Kinata, Chris and Charles Kyd. *The Complete Guide to Microsoft Excel Macros*. Redmond, WA: Microsoft Press, 1991.

Kyd, Charles W. *Microsoft Excel Business Sourcebook*. Redmond, WA: Microsoft Press, 1988.

Microsoft Corporation. *Microsoft Excel 3 Step by Step*. Redmond, WA: 1990.

Nelson, Stephen L. *Microsoft Excel Money Manager*. Redmond, WA: Microsoft Press, 1989.

Nelson, Stephen L. *Microsoft Excel Small Business Consultant*. Redmond, WA: Microsoft Press, 1989.

Salkind, Neil J. *Excel: A Business User's Guide*. New York, NY: John Wiley & Sons, Inc., 1989.

Schieve, Paul L. and Jon I. Young. *Illustrated Microsoft Excel 2.10*. Plano, TX: Wordware Publishing, Inc., 1989.

The Cobb Group with Craig Stinson. *Running Microsoft Excel*, 2nd edition. Redmond, WA: Microsoft Press, 1991.

The Cobb Group: Douglas Cobb and Allen McGuffey with Mark Dodge. *Microsoft Excel 3 Companion*. Redmond, WA: Microsoft Press, 1990.

Appendix C Using Microsoft Excel with Networks

In a *network*, several computers that are connected electronically can share data. If your computer is linked with other computers on a network, you can run Microsoft Excel from that network and also maintain your personal preferences for settings such as screen colors, default printers, and printer ports. This appendix assumes that you know how to use your network software to connect to network drives and how to find files stored on network computers.

Table of Contents

Running Microsoft Excel from a Network Computer ... 699

Using Documents on a Network ... 700

Printing from a Network ... 701

Running Microsoft Excel from a Network Computer

The Microsoft Excel program files that are typically installed on your computer's hard disk can also be installed in a network file folder. You can then run Microsoft Excel on any computer with access to the network folder. For information on network use restrictions, see your Microsoft Excel license agreement.

Installing Microsoft Excel on a network computer

1. Use the Chooser to connect to the network computer where you want to install Microsoft Excel.
2. Run the Microsoft Excel Installation program. When the Installation program asks for the name of the folder where you want to install Microsoft Excel, specify a drive and folder on the network server.

For more information on installation, see *Microsoft Excel Getting Started*.

NOTE You must have read-write access to the network file folder for the Installation program to install Microsoft Excel on a network. For information on read-write access, see your network software documentation.

Starting Microsoft Excel on a network

You can run Microsoft Excel from a network drive as if it were stored on your own hard disk.

NOTE You can use a folder shared on a network as your additional startup folder. This lets all network users have the same startup folder. Follow the procedure in "Specifying a Startup Folder and Document" in Chapter 16. Specify the full network pathname for the shared folder you want to use as your startup folder.

1. Use the Chooser to connect to the server containing Microsoft Excel.
2. Double-click the Microsoft Excel icon.

Using Documents on a Network

By running Microsoft Excel from a network, many users can share and print the same documents. There are several ways you can use and protect documents that are shared on a network.

Using Shared Documents

You can use a shared document on the network in the following ways:

- Open the document with read-only access.
- Open the document with read-write access.
- Create links between your personal Microsoft Excel document and a shared document on the network. For information on linking, see "Linking Documents," in Chapter 8.

Opening a document

With read-only access you can open a document, but you can't edit it. In a shared data environment such as a network, it's a good idea to open a document as read-only unless you need to edit the document.

With read-write access, you can open a document and edit it. To prevent multiple users from making changes to the document at the same time, only one user at a time can open a document with read-write access.

To do this procedure, you must have logged on to the network computer containing the document you want to use.

1. Choose File Open.
2. Switch to the drive and folder containing the document you want to open.
3. In the list, select the name of the document you want to open.
4. To open the document with read-only access, turn on the Read Only check box.

   To open the document with read-write access, turn off the Read Only check box.
5. Choose the Open button.

NOTE If you try to open a document with read-write access while another user with read-write access is working on the document, Microsoft Excel displays a message saying that the document is read-only. Choose OK to open the document with read-only access; choose Cancel to cancel the command. Microsoft Excel also displays a message if you try to open a file while another user is in the process of opening the file.

Protecting Shared Documents

Microsoft Excel can protect documents from unauthorized changes. For specific data protection procedures, see "Protecting Documents and Windows" in Chapter 16.

There are four ways to protect a Microsoft Excel document stored on a network:

- **Allow only authorized users to open it** Save the document with a password, using the File Save As command. Give the password only to authorized users.
- **Prevent anyone from editing it** Lock all the cells in the document, using the Format Cell Protection command. Protect the document with a password, using the Options Protect Document command.
- **Allow only authorized users to edit it** Lock all the cells in the document, using the Format Cell Protection command. Protect the document with a password, using the Options Protect Document command. Give the password only to those authorized to edit the document. You can also use the Write Reservation Password or the Read-Only Recommended options of the File Save As command to restrict editing to authorized users.
- **Hide part of it from unauthorized users** Hide cells by setting the column width or row height for the columns or rows containing the cells to zero. Protect the document with a password, using the Options Protect Document command. Give the password only to those authorized to edit the document.

Printing from a Network

The procedures for printing from a network are generally the same as regular printing procedures. If you have more than one printer set up to use with Microsoft Excel, you can use the Chooser to specify the printer you want to use. You also use the File Page Setup command to change printer settings, no matter how many printers are set up.

For information on printing and printer setup, see Chapter 15, "Printing."

Index

1-2-3 *See* Lotus 1-2-3
12-hour clock 87
24-hour clock 87
1900 date system 91, 291
1904 date system 91, 291
2-D chart *See* Chart
3-D chart
  area chart 410
  axes *See* Axis
  column chart 410
  floor, selecting 437-438
  formatting
    plot area 490-492
    view angles 493-495
  gridlines 467-469
  line chart 410
  multicategory, plotting 407
  pie chart 410
  plot area 490-492
  printing on plotters 542
  view, adjusting 493-495
  walls, selecting 437-438

A

A1 reference style
  See also Absolute reference; Relative reference
  changing from 117
  described 109, 604
Absolute reference
  See also Relative reference
  A1 notation 108
  changing 118-119
  command macros
    converting references to values 604-607
    using 581
  defined 109, 604
  formulas, using 109-111
  moving data, effect on references 118
  R1C1 notation 108
Accountant's keypad 102
Activating
  formula bar 80-81, 98, 101, 105
  hidden window 26, 546
  menu bar 7-8, 15-16
  windows 24-25, 546
Active cell
  See also Cell
  data, entering 82
  defined 64
  location 63
  reference, displaying 249
  scrolling to 171
Active window
  See also Window
  defined 21
Actual-size view
  See also Previewing printing
  described 534
  scrolling 536-537
  switching 535
Add-in file format
  described 134
  functions and command macros described 647
  opening as regular macro sheet 648
Add-in function
  creating 128, 572, 647-648
  custom functions
    differences 574
    saving as 572
  macro sheets, supplied functions 673
Add-in macro
  command macros, saving as 603, 647-648
  creating 647-648
  creating international 651-652, 654
  defined 647
  features 662-663
  opening 647-648, 676-678
  protecting 648
  removing 677
  samples 676
  startup document 648, 676-678
  supplied macros 672
  templates, using 648
Add-in Manager macro 676-678
ADD.BAR function 645
ADD.COMMAND function 639
ADD.MENU function 639, 645
Adding
  See also specific subject
  borders 196-197
  buttons 586
  chart arrows 464-470
  chart axes 457-460
  chart data series 438-440
  chart gridlines 467-468
  chart legends 453-454
  chart text 472-474
  columns 158-159
  comments to worksheets
    See also Note; Text box
    procedure 234-242
  consolidating from Lotus 1-2-3 56
  consolidating source areas 328
  custom commands to menus 637-639
  custom dialog box group items 620-621
  custom Help 368, 646
  custom menu bars 644
  custom menus 643-644
  embedded charts 391-392, 394, 696
  glossary entries 681
  graphic objects 511-512
  gridlines
    to charts 467-468
    to printing 528
    to worksheets 206-207, 528
  numbers
    addition operator 107
    auto-sum button 66, 128
  overlay charts 422-425
  printers 526
  records to database 349-350
  records with data form 359
  rows 158-159
  shading 197-198
  sheets to a workgroup 393-395
  text boxes 235-236
  titles to worksheets 530-531

Addition operator (+) 107
Address *See* Reference
ALERT function 614
Alignment
  buttons 66, 188
  cell contents 187-188, 189
  center 186-188
  chart text, formatting 477-479
  command macros 608
  custom dialog boxes 627
  footers 531-532
  General 186
  graphic objects 501, 513-514
  headers 531-532
  left 186-188
  Lotus 1-2-3 conversion 56
  numbers 187-188
  printed pages 528
  right 186-188
  text
    in a button 190, 584
    in a text box 190, 237
    procedure 186-188
    wrapping 91, 187, 191
  text boxes 190, 237
  worksheet data 186-187
Alphabetizing *See* Sorting
Alternate menu activation key 15
Alternate Startup Folder macro 672
AM, custom formatting symbol 185
Amortization table, sample 669
Ampersand (&), text operator 107
Application
  chart pictures, copying 523
  graphic objects, exchanging 521-524
  pictures, exporting 522-523
  running with command macros 592
APPLY.NAMES function 276
Applying *See specific subject*
Arc
  See also Graphic object
  described 86, 499-503
Area chart
  See also Chart
  described 408
Argument
  array functions 276-277
  arrays, automatic sizing 278-279
  command macros
    data types, converting 605-607
    references, using as arguments 605, 607
    starting, using parentheses 605
  custom functions
    error return value 564, 574
    incorrect data types, testing 569
    maximum number 568
    missing, error return value 569
    optional 569
    organization 568
    requirements 564-568
  database functions 383-385
  defined 126
  nesting functions 132
  optional arguments 126
  SERIES function 446
ARGUMENT function 564-569
Arithmetic operators 107
Array
  arguments, sizing 278-279
  command macros, using 607
  constant *See* Array formula
  custom functions
    calculating 572
    documenting 572
    error return value 569
    individual elements, obtaining 569
    individual values, changing 569
    required for multiple values 569
    size adequacy, testing 569
    size limit 568-569
    using 276-280, 567-569
  expanding, automatic 278-279
  formula *See* Array formula
  functions 276-277
  Lotus 1-2-3 conversion 56
Array *(continued)*
  range *See* Array range
  tables, editing 263-264
Array formula
  array constants
    charts, plotting 280
    contents 275
    defined 268, 274
    entering 274-276
    separator characters 274
    sizing 273
  creating 280
  defined 113
  delimiters 113, 270
  described 269-270
  editing 114, 272-273
  entering 113-114, 271-272, 279
  external references, using 278
  multiple results, producing 269
  particular value, finding 280
  relative references, using 278
  return functions, determining 277
  sizing 278-279
  troubleshooting 280
Array functions 276-277
Array range
  arguments, sizing 278-279
  array formulas, using 279-280
  clearing 274
  congruence with array formula 272
  converting to constant values 273
  described 271
  editing 272-274
  maximum size 280
  selecting 73, 273
  values, extracting 280
Arrow
  creating 237-238
  described 237
  graphic objects *See* Graphic object
ARROW keys
  See also Movement keys
  commands, choosing 14
  dialog boxes, moving in 14
  formula bar, moving in 98-99

ARROW keys *(continued)*
  text boxes, moving in 14
  using 31
Arrowhead *See* Graphic object
Ascending sort *See* Sorting
Asterisk (*)
  custom formatting symbol 184
  multiplication operator 107
  wildcard character
    criteria, using with 374
    database searching, using 361
    finding text 171
At sign (@)
  custom formatting symbol 184
  formula entry, Lotus 1-2-3 style 119
Attached text *See* Chart text
Attribute, cell attributes, copying 150
Auditing
  cells
    checking types 243-245
    naming 248-249
    selecting 247-250
  dependents, working with 247, 250-251
  described 242-243
  features 657
  Info window 245-247
  names
    checking 248-249
    listing 249
  precedents and dependents, working with 247, 250-251
  Worksheet Auditor macro 690-691
Auto Indent macro 687
Auto_Open, automatic macros 618
Auto Save macro 678-679
Auto-sum button 66, 128
Automatic backup files 131-132
Automatic calculation
  command macros, speeding up 613-614
  described 286
  switching 287
Automatic macro
  at document closing 618-619
  at document opening 618
Automatic macro *(continued)*
  bypassing 619
  creating 618-619
  event-triggering 619-620
  features 662-664
  hidden names, using 619
  preventing document closing 619
Automatic page breaks 529
Automatic saving 678-679
Automatic sizing, arguments 278-279
Automating routine tasks, command macros 591
Axis
  adding 457-460
  category 395-396, 457, 458
  chart axes described 457
  color 465
  data series 396, 458
  defined 396, 457
  deleting 460
  formatting
    pattern 465
    scaling 464
    tick marks 465-466
  horizontal 457
  labeling 458-459, 464-466
  scaling
    3-D data series axis 464
    described 461
    formatting 464
    x-axis 461-462
    y-axis 462-463, 464
    z-axis 462, 463, 464
  selecting 435-437, 461-462
  tick mark label, controlling 458-459, 464-466
  value axis 393-394, 457, 458
  vertical 457

B

Backslash (\), custom formatting 184
Backup file
  charts 429
  worksheets 131-132
Bar chart
  See also Chart
  described 408
Best Fit button 120, 192
BIFF file format 333
Bitmap file format 333
Blank
  selecting 72
  sort order 173, 355
Blank cell
  See also Cell
  inserting 158-159
  selecting 72
  sort order 173, 355
Bold button 65-66, 177
Bold formatting 66, 177
Border
  See also Formatting
  adding 196-197
  chart data markers, formatting 480-489
  chart text, formatting 478-479
  color 197
  described 196-197
  graphic object, formatting 512-516
  styles 196-197
  troubleshooting 198
Bottom border 196
Braces ({ })
  array constants, entering 274
  array formula delimiters 113, 270
Brackets ([ ]) 117-118
Branching, command macros
  described 597-598
  error handling 597
Break-even analysis 668-669
BREAK function 599, 600, 603
Breaking pages *See* Page breaking
Breakpoint
  defined 682-684
  macro debugger 611, 682-684
Budget, sample 669-670
Built-in format
  See also Formatting
  currency 84-86, 179
  dates 86-89, 179-180
  numbers 84-86, 178-179
  times 86-89, 179-180

Button
command macros
assigning command macros to 584-589
creating 586
displaying on a worksheet 207
formatting button text 177-178
outlining
collapse 228, 230
demote 66, 227, 230
expand 230, 233
outlining levels 240
promote 66, 227, 230
row and column level 228, 231
select visible cells 66, 227, 231
show outline symbols 66, 227-229
tool bar
alignment 66, 188
auto-sum 66, 128
bold 66, 177
italic 66, 177
Button tool 66, 584

C

CALC indicator *See* Status bar
Calculation
See also Iteration
automatic
described 285-286
switching to manual 287
circular reference formula 283
command macros 577-578
controlling 285-292
controlling, DDE link 312
convergence 285
custom functions 572
data tables, speeding up 265, 290
date system, effect on 90, 291
dates, using in 90
default setting 191, 285
defined 285
displayed vs. stored values 91, 289
divergence 285
features 658
Calculation *(continued)*
formulas, order of evaluation 114-115
full precision defined 91, 292
iteration, order 284
macro sheets 289, 571, 577-578
manual
as default calculation setting 292
described 286-287
switching to automatic 287
operators *See* Arithmetic operators
options 286-290
order
during iteration 284
Lotus 1-2-3 conversion 54
precision 91, 292
procedures 287
repetitive *See* Iteration
selecting 287
tables, recalculating 263, 287
times, using in 94
worksheets 285, 292
Camera tool 66, 520
Cancel box, formula bar 81, 111
Canceling
actions 8, 99, 118-119
cell editing 99
cell entries 84
charts, selection from all items 438
commands 8, 99, 118-119
custom dialog box changes 622
data form changes 358
drawing tool selection 502
formulas 111
iteration 284
marquees 146
print titles 530-531
printing 540
publishers 317-321
startup documents 554
subscribers 317-321
Capitalization, database, effect 350
Caret (^), exponentiation operator 107
Category axis *See* Axis
Category names argument, chart series formulas 447
Cell
active cell
data, entering 82
defined 64
reference, displaying 249
scrolling to 171
address *See* Reference
aligning
contents 187-188, 189
with graphic objects 501, 513-514
array constants, entering 274
array formulas, entering 272
auditing
Info window, using 243-247
naming, precedent and dependent cells 251
blank cells
inserting 159
selecting 72
sort order 173, 355
chart text, linking to 475-476
clearing
deleting, differences 160
described 159
procedure 97, 160
color, changing 185
command macros, calculating 577-578
comments
See also Note
Lotus 1-2-3 conversion 53
comparison cell defined 167
contents
alignment 187-188, 189
clearing 160
color 185
displaying in Info window 249
editing 97-104
formatting 175-186
selecting 69-75
types, selecting 164-165, 247

Cell *(continued)*
copying
adding copy area to paste area 151-152
attributes only 150
camera tool, using 66
combining contents 150-152
copy area defined 144
data to adjacent cells 148
described 141-142, 150
filling selections 149
inserting 146
into multiple selections 147-148
marquee, canceling 146
marquee defined 144
names and ranges, effect 156-157
nonblank cells only 153
paste area defined 145
procedure 99, 144-146
references, effect 155-156
transposing 152-153
troubleshooting 157-158
visible cells only 153
cutting *See herein* moving
data, entering 79-80, 82-83
defined 61, 64
deleting
clearing, differences 160
described 159
procedure 161
dependent cells
defined 166, 246
displaying 171, 245, 251
finding, Formula Select Special command 166-168
finding, Info window 245, 247
displaying formulas in 206
editing
canceling 99
described 97-98
procedure 98
using formula bar 95-96
entering data 79-80, 82-83
Cell *(continued)*
exporting to text file 679-680
filling 149, 154
finding
comparison cell procedure 167-169
described 161-162
different cells, same row or column 169
Info window, using 243-245
last cell 73, 165
precedents, dependents 166-167
procedure 162-163
replacing data 163-164
specific cells and contents 164-165
types of 71-742 164-165
formatting
borders and background patterns 196-198
contents 175-186
size 191-195
formulas
displaying in 125, 206
entering references 111
functions, entering 11, 126-127
hiding 559
inserting
blank cells 158-159
cut cells between existing cells 144
procedure 44, 158-159
last cell, finding 73, 165
linking ranges 303
locking 561-562
moving
cut area defined 142
described 142-143
inserting 144
marquee defined 142
paste area defined 142
procedure 144
references, effect 154-155
troubleshooting 157
Cell *(continued)*
naming
See also Name; Naming
command macros, using 608
deleting 217
described 215-216
multiple names, creating 217
procedure 216
notes *See* Note
numbers, entering 84-86
outlining, selecting visible cells 231, 234
picture *See* Picture
precedent cells
defined 166, 246
direct precedent defined 171, 251
displaying 171, 245, 251
finding, Formula Select Special command 166-168
finding Info window 245, 247
indirect precedent defined 171, 251
protection
appearance differences 561-562
described 559
Lotus 1-2-3 conversion 56
removing 561
setting 559
range *See* Range
recorder range 578, 580
reference
array formulas, using 268
data table input cell 259, 262
replacing with names 218-219
using 108-110
selecting
by contents 72-73
described 69-70
extending selections 71
last cell 73
multiple selections 70-71
visible cells 73
selection defined 69

Cell *(continued)*
styles
applying 199-200
attributes 200
copying from another document 202
creating 200-202
creating by definition 201-202
defined 198
deleting 205
Normal style, redefining 204-205
redefining 203-204
target *See herein* dependent cells
text
See also Text
entering 89-90
size limit 89
wrapping 91
types, selecting 72-73, 165-166
Cell names *See* Cell; Name
Cell pointer *See* Active cell
Cell protection *See* Cell; Protection
Cell reference *See* Cell; Reference
Center alignment 186-188
Centering
cell contents 187-188, 189
document when printing 528
footers 531-532
headers 531-532
pages 528
Changing
column width 93, 120, 191-192
drives 134, 430
folders 68, 134,139, 430, 452
reference style 117
row height 193-194
Chart
See also specific chart
3-D charts *See* 3-D chart
area charts 408
array constants, using 280
arrows *See* Chart arrow
attached text defined 396
axes *See* Axis

Chart *(continued)*
bar charts 408
calculating 287
clearing 485, 489
closing 431-432, 442
cluster spacing 485
column charts 391, 409
combination charts 409, 423
combining with worksheets 391, 393, 394, 518-521
copying as picture 519
copying data series 440
creating 391-394, 400-407
creating from discontinuous selection *See herein* multiple selections
custom color palettes, creating 554-555
customizing
overlay chart, adding 425
procedures 425
data marker *See* Chart data marker
data series *See* Chart data series
database, using 352
default settings 391, 412-414
defined 391, 395
deleting
from disk 448-450
from worksheet 449 5
described 391, 395-396
document type 20
drop lines, selecting 437
editing
data 438-448
embedded charts 393, 434
opening charts 433-435
selecting chart items 435-438
embedded charts
creating 391-392, 394, 696
defined 391
deleting 448, 449
displaying 207
editing 393, 434
hiding 207
opening in its own window 434
saving in its own file 427
using 391

Chart *(continued)*
features 660-662
fonts 477-478, 479
formatting 408-421, 451-496
formula *See* Series formula
gridlines *See* Gridlines
handles described 435
hi-lo lines, selecting 437
legend *See* Chart legend
line charts 409
linking 308, 519
Lotus 1-2-3 conversion 48
menu bar *See* Chart menu bar
multiple selections
making 71, 406
plotting 404-406
naming guidelines 429
objects, selecting 456
opening
described 433-435
procedure 434
updating 433
overlay charts *See* Overlay chart
picture *See* Picture
picture charts 485-488
pie charts 409
plot area
See also Plot area
defined 396
described 490-491
formatting 490-492
selecting 437, 492
preferred chart
changing to 412, 413
customizing 413
described 391, 412
format 391
setting 413
printing
described 495-496, 542
procedure 496, 542
sizing 528
troubleshooting 496, 542
protecting 430, 556-562

Chart *(continued)*
publishers, creating 317-321
saving
backup file, automatic 430
existing charts 428-429
first time 428
procedure 427-430
same name as worksheet 429
xy (scatter) charts 409
scale 396
selecting items
canceling 438
classes of items 437
compressing 405
described 435-436
entire chart 437
menu commands, using 437
plot area 437, 492
procedure 436, 437
series, editing 441-444
series formula *See* Series formula
sizing 528
source data, checking 430
specifications 395-396
templates
formatting 435
opening 435, 492
using 551-553
text *See* Chart text
tick mark defined 396
tool 65, 394
troubleshooting 431, 496, 542
types
changing 408-421
described 408-410, 414-421
unattached text defined 397
"what-if" analysis 445
xy (scatter) charts 409
Chart Add Arrow command 470
Chart Add Legend command 402, 452-453
Chart Add Overlay command 423, 425
Chart area *See* Plot area

Chart arrow
adding 464-470
deleting 469-470
described 469
formatting 471-472
moving 471
selecting 470
sizing 471
Chart Attach Text command 473
Chart Axes command 460
Chart Calculate Now command 287
Chart Color Palette command 554
Chart data marker
changing value 445, 480-489
defined 395
formatting
borders 480, 484
clearing 485
color 486
layout 482-483
line, xy(scatter) charts 484-485
patterns 484
spacing 482
picture charts
changing 489
clearing 489
defined 480, 485
stacked 487, 488-489
stacked and scaled 487, 489
stretched 486
using 485-487
replacing with picture 488
selecting 481
Chart data series
adding 438-440
clearing 444
combination charts, changing 424
controlling plotting 406-407, 439
copying from another chart 440
copying from worksheets 439
creating 441-442
default plotting 406-407
defined 392, 396
deleting 444
editing 441-442

Chart data series *(continued)*
formatting 411
plotting 406-407, 439
selecting 437
series formula 404, 441-444
specifying by worksheet selection 439
Chart Delete Arrow command 472
Chart Delete Legend command 452, 453
Chart Delete Overlay command 425
Chart Edit Series command 406, 426, 441-442
Chart Edit Series dialog box 447-448
Chart Full Menus command 9-10
Chart Gridlines command 468
Chart legend
adding 453-454
defined 396, 452
deleting 453-454
displaying 452
formatting 455-456
moving 454-455
selecting 436, 454
text, formatting 456
Chart menu bar
commands 5
described 15
Chart object
See also specific object
selecting 456
Chart Protect Document command 430, 560, 561
Chart Select Chart command 438, 477
Chart Select Plot Area command 438, 492
Chart Short Menus command 9-10
Chart text
adding
attached text 472-474
unattached text 474
aligning 477-479
attached text
adding 473-474
defined 396, 472

Chart text *(continued)*
borders 479
defined 396, 472
deleting 475
editing 477
formatting
alignment, orientation 478-479
borders, patterns 479
described 477
font 477-478, 480
linking to worksheet cell 475-476
selecting 437-438, 474-475
unattached text
adding 474
defined 396, 472
Chart tool 66, 394
Chart types 408-410, 414-421
Check box defined 11
Check mark, adding to, removing from commands 640-641
CHECK.COMMAND function 640-641
Choose defined xii
Circle
See also Graphic object
described 65, 499-502
Circular reference
convergence defined 285
defined 283
divergence defined 285
finding 343
iteration *See* Iteration
solving 283-285, 292
Clear command *See* Edit Clear command
Clearing
See also Deleting
array ranges 274
cells, procedure 97, 159-160
chart data markers
formatting 485
picture chart 489
chart data series 444
charts 485, 489
defined 159
deleting, differences 160
Clearing *(continued)*
formatting 162
notes 160
outline 229
table values 264
tables 264
Clipboard
described 141
displaying contents 333
exchanging data
copying from Microsoft Excel 332
copying to Microsoft Excel 332-333
described 331
exchanging graphics
copying from Microsoft Excel 522
copying to Microsoft Excel 522
formats supported 333, 665
formula bar, pasting characters from Clipboard in 97
Close command *See* File Close All command; File Close command
Closing
all open files 137
charts 431-432, 442
data form 359
DDE channel 340
documents
preventing closing 619
procedure 139-140, 441
Info window 247
menus 9
online Help 19
preview window 538-539
windows 137
worksheets 137
Code resource library 649-659
Collapse button 227-228
Collapsing outline level 230
Collating *See* Sorting
College expense planning, sample 670
Colon (:), range operator 108, 223
Color
border 197
button text, formatting 587-588
cell contents, changing 185
chart axis 465
chart data markers 484
chart legends 456
chart plot area 490
chart text 477-478
column headings 206
custom formatting symbols 185
custom number formats, using 555
gridlines, setting 206
headings 206
number formatting 182-183
object, copying to new document 555
pictures, copying to external applications 523
row headings 206
text boxes 236-237
Color editing dialog box, custom color palettes 554
Color palette, customizing *See* Custom color palette
Column
blank, plotting charts 404-406
changing width *See herein* width, changing
charting 401-403
copying, transposing 192-194
deleting
described 159
Lotus 1-2-3 conversion 44
entries too wide, displaying 93, 120, 192
finding different cells 169
headings
color 207
described 64
displaying 206-207
hiding 193, 206, 234
printing 527-528
hiding 192-194, 206, 234
inserting
described 158-159
Lotus 1-2-3 conversion 44

Column *(continued)*
macro recording, multiple columns 580
maximum number 61
multiple columns
pasting 152-153
selecting 75
widths, setting 93, 120, 192
outlining
column level bar 228
column level button 228-231
demoting 227, 229-230
displaying symbols 229
hiding 233
promoting 227, 230
print titles
canceling 531
setting 530-531
range names, references 222
selecting 75, 161
series
entering in multiple columns 255-256
entering in single column 255
sorting 353-354
titles, freezing 78, 212
transposing 152-153
unhiding 193, 233
width
best fit 93, 120, 192
changing *See herein* width, changing
database, sizing 352-353
font size, effect 200
formula results too wide 120
handles, displaying 540
Lotus 1-2-3 conversion 45
maximum 195
standard described 195
troubleshooting 93, 195
width, changing
best fit 93, 120, 192
described 191-193
Lotus 1-2-3 conversion 45
Column chart
See also Chart
described 391, 409
COLUMN function 276, 567
Column heading *See* Column
COLUMNS function 276, 569
Combination chart
See also Chart; Overlay chart
creating 409, 423-425
data series, changing 426
defined 422
formatting 425
new chart, changing to 424
Combining charts, macro sheets, worksheets 518-521
Combining criteria 375-377
Combining graphic objects 501
Comma (,)
array constants, separator character 274
custom formatting symbol 184
union operator 107
Comma separated values file format 334
Command
See also specific command
adding, command table 638-639
button 11
canceling 8, 99, 118-119
carrying out 7-8
changing built-in command 641
check marks, changing, built-in or custom command 640-641
choosing
ARROW keys 15
keyboard procedure 8, 15
menu key, changing 15
mouse procedure 7
procedure 7-8
tips 15-16
custom commands *See* Custom command
deleting 641
dialog box 6
dimmed commands 6
Command *(continued)*
locating 5
renaming 639-640
repeating 9, 102
shifted commands 8
undoing 8-9
workgroups, table of commands 296-298
Command button 11
COMMAND key combinations 31-34
Command macro
add-in macros *See* Add-in macro
alignment 608
arguments, data types, converting 605-607
arrays, using 607
assigning to button, graphic object
adding buttons 584-586
changing 587
creating 586
described 584-585
invisible object 589
macro not found error 589
positioning, sizing 508-509
procedure 586
shortcut keys 589
text alignment 588
text formatting 587-588
troubleshooting 589
audience, determining 592
automatic macros *See* Automatic macro
branching
described 597-598
error handling 597
GOTO function 597
IF function 598
calculating procedure 577-578
cell names, using 608
cells, calculating 578
comments 581, 608-609
conditional branching *See herein* branching
consolidating with 330
control macro, using 593
creating 578-582, 591-594

Command macro *(continued)*
custom dialog boxes
initial values, setting 630
passing parameters 630
running 621
using 628-637
DDE, using 337-340
debugging 611, 681-684
defined 575
designing 591-594, 616-617
dialog boxes, creating 596, 620-628
documenting 608
dynamic dialog boxes, using 635-636
editing 584
error handling 593-594
error messages, creating 609
event-triggering 619-620
examples 591
features 662-664
formatting 608
getting user input 601-602
graphic objects with assigned macros 507, 514, 584-589
hidden names, using 224
indenting 687
international 651-652
interrupting 610
looping 598-601, 603
macro debugger, using 611
macro function defined 578
macro sheet, opening 570, 575-578
menu, placing on 583
moving, relative references, using 607
names
hidden 224, 623
pasting 603
using 224, 596
naming 595, 596, 608
notes 608
opening existing macro sheet 577

Command macro *(continued)*
planning
procedure 591-594
structured programming techniques 593
range
defining 580
message 582
multiple columns 580
recorder range defined 578, 580
recording
editing 579
partial 596
pausing 578
planning 579
procedure 577-578
range, determining 580
references
converting to values 605-606
displaying 607
style, changing 581-582
removing indenting 687
running
automatically 583
clicking button or object 583
described 582
macro sheet, opening 577
procedure 582-583
sheet *See* Macro sheet
shortcut keys
assigning 581, 589, 594, 596
conflicts 581
simplicity 603
slowing down 614
speeding up 613-614
starting
from another command macro 602-603
recursive self-start 603
stopping 596
subroutine macros, using 593, 617
templates, using as 551
testing 583, 609-613
text, skipping 608

Command macro *(continued)*
troubleshooting 583-589
unconditional branching *See* GOTO function
uses 591-592
values, displaying 578
workspace file, opening 547, 548-549
writing 581, 594-596
Command table, creating 638
Command Window utility 688
Commenting
See also Note
command macros 581, 608-609
custom functions 572
Lotus 1-2-3 conversion 53
worksheets 234-235
Compare value
ascending order 268
lookup tables 268-269
Comparison cell
See also Cell
defined 167
Comparison criteria *See* Criteria
Comparison operator
criteria, using with 361, 373
database searching 359-362
described 107-108, 361-373
Computed criteria *See* Criteria
Computed field 348, 374-375
Concatenation operator (&) 107
Configuring printer *See* Printer
CONSOLIDATE function 276
Consolidating
by category 326-327, 330
by position 327
command macros, using 330
defined 324
destination areas described 325
functions, using 326
linking to source data 327
Lotus 1-2-3 329
names, using 329
procedure 326-328

Consolidating *(continued)*
source areas
adding 328
deleting 328
described 325
editing references 328
troubleshooting 330
undoing 327
wildcard characters, using 329
Constant, array *See* Array formula
Constant value
See also Date; Number; Time
array ranges, converting 273
defined 79
displaying 80
entering into worksheet 80
error values, entering as 92
formats 84-86
logical values, entering as 92
Lotus 1-2-3 conversion 53-56
naming 223
selecting 77, 80
table values, converting 264
types 79
Context-sensitive Help 17, 646
CONTROL key combinations 31-34
Control macro *See* Command macro
Conventions for documentation xii-xiii
Convergence *See* Iteration
Converting Lotus 1-2-3 42-58
Converting operand values 116-117
Copy area defined 144
Copying
cells
adding copy area to paste area 151-152
as pictures 516-519
attributes only 150
between documents 296
camera tool, using 66
combining contents 150-152
contents 99, 144-146
data to adjacent cells 148

Copying *(continued)*
cells *(continued)*
described 141-142, 150
filling selections 149
formats 150
into multiple selection 147-148
multiple paste areas 147-148
names and ranges, effect 156-157
nonblank cells only 153
paste area defined 145
procedure 99, 144-146
references, effect 155-156
transposing 152-153
troubleshooting 157-158
visible cells only 153
characters in formula bar 149
charts, as pictures 519
columns, transposing 152-153
custom color palettes 556
data, Lotus 1-2-3 43
dialog boxes to macro sheets 628
formula bar, copying characters 149
formulas to multiple cells 148-149
from Microsoft Excel 335
graphic objects 510, 512, 522
Lotus 1-2-3 conversion 43
pasting multiple copies 147-148
references, effect on 155-156
rows, transposing 152-153
styles from another document 202
to Microsoft Excel 334-335
values 151-152
workgroup data 296
Creating
See also specific subject
add-in functions 128, 572, 647-648
array formulas 280
backup files 131-132, 429
borders 196-198
chart series formulas 446-448
charts 391-394, 400-407
command macros 578-582, 591-594
criteria ranges 371-373

Creating *(continued)*
custom applications 615, 618-620
custom color palettes 554-556
custom commands 637-642
custom data form 365-368, 628
custom dialog boxes 620-628
custom formats 180-183
custom functions 128, 570-572
custom Help 368, 646
custom menus 643-644
data forms 356-358
databases 350-352
dynamic dialog boxes 635-636
footers 531-532
formulas 107-108, 110-111
headers 531-532
international macro sheets 651-654
links 299-317
macro sheets 575-578
multiple selections 77-78, 373, 404-407
notes 234-242
number formats 84-86, 178-182
outlines 228-229
overlay charts 424-427
password 557
picture charts 485-489
publishers 317-321
range names, Lotus 1-2-3 45
records in databases 3497, 349, 350
startup folder 549-550
styles 194-195, 200-202
subscribers 317-321
tables 257-266
templates 551-553
text boxes 235-236, 499
workgroups 294-295
worksheets 61-62
workspace files 69, 544-549
xy (scatter) charts 398
Criteria
combining 375-377
comparison criteria 371-378
comparison operators, using 361, 373

Criteria *(continued)*
computed criteria 371-378
defined 360, 369, 371
defining on separate worksheets 378
entering 369, 373-375
naming 372, 378
random sampling 378
range 266, 369-375, 384-385
types 371
CSV file format 333
CTRL key *See* CONTROL key combinations
Currency formatting 84-86, 179
Currency symbol, international macro sheets 653
Current cell *See* Active cell
Cursor *See* Insertion point
Custom application
command macros *See* Command macro
creating 615, 618-620
custom data form *See* Custom data form
designing 616-617
dialog boxes, drawing 620-624
menus, drawing 616, 642-648
Custom color palette 554-556
Custom command
adding to menus 637-639
check marks, changing 640-641
command table, creating 638
creating 637-642
deleting 641
disabling/enabling 640
international macro sheets, using 654
renaming 639-640
Custom data form
creating 365-368, 628
customizing Help 368
database, defining 368
described 365-366
edit boxes 365
fields 366
name, defining 368
procedure 367
static text 365
Custom dialog box
adding items 620-621
aligning 627
automatic sizing, canceling 622
changing, canceling 622
copying to macro sheet 624
creating 620-628
custom data forms, creating 366
custom forms 629
defaults, specifying 637
definition table
described 629-630
manual creation 638
naming, formatting 638
deleting items 622
dialog box definition, defined 621
displaying 626
dynamic dialog boxes 636
groups 623
initial values, setting 630
items described 630-634
keyboard, using 637
location, changing 626-627
maximum contents 627
movable, creating 628
moving items 622, 626
number formats 627
position, measuring 627
procedures 621-623
returned values, using 630
selecting items 621-622
sizing items 622-623
using with command macros 621, 628-637
Custom format 180-183
Custom function
add-in functions
differences 574
saving as 572
arguments
error return value 564, 574
incorrect data types, testing 569
maximum number 568
missing, error return value 569
Custom function *(continued)*
arguments *(continued)*
optional 569
organization 568
requirements 564-568
arrays
calculating 572
documenting 572
error return value 569
individual elements, obtaining 569
individual values, changing 569
required for multiple values 569
size adequacy, testing 569
size limit 568-569
using 276-280, 567-569
code resource, registration as 649, 650
commenting 572
creating 128, 570-572
data types
specifying 564, 566-567
testing 569
defined 563
deleting 574
designing 563
documenting 572
entering 573
errors, returning useful values 569
examples 564
features 662-664
formulas
calculating 570
designing 566
entering 573
incorrect values, testing 568
input errors, anticipating 568-569
listing 128
name display, finding 574
naming 571
opening at startup 574
passing references 566
results
data types, specifying 566-567
error return value 567

Custom function *(continued)*
troubleshooting 574
using 126-128, 573
Custom Help 368, 646
Custom menu
creating 643-644
deleting 644
disabling 644
menu table 643-644
renaming 644
Custom menu bar
adding 644
creating 645
deleting 646
displaying 646-647
Custom number, date, or time format
creating 180-183
custom colors, using 555
deleting 183
listing 183-185
procedure 180-183
Cutting *See* Edit Cut command

D

Data
See also specific type
alphabetizing *See* Sorting
cells, entering *See herein* entering
consolidating *See* Consolidating
editing 110
entering
procedure 79-80, 82-83, 90-92
troubleshooting 93-94
exchanging with other applications 331-336, 664
exporting 331-336, 679-680
extracting 381-384
finding 162-171
form *See* Data form
formatting *See* Formatting
importing 331-336, 679-680
international macro sheets 654
Lotus 1-2-3 *See* Exporting; Importing
markers *See* Chart data marker
Data *(continued)*
modes described 103-104
moving 141-144
multiple worksheets, entering 90
outlining 233-234
range, entering 82-83
replacing 163-164
series *See* Chart data series
sorting *See* Sorting
tables *See* Table
types, error handling command macros 595
workgroups 295-296
Data Consolidate command 325-327
Data Delete command 143, 372, 384-385
Data Exit Find command 379
Data Extract command 372, 381, 382
Data Fill *See* Data Series command
Data Find command 372, 379
Data form
adding records 359
changes, canceling 358
closing 359
comparison criteria, using 361
creating 356-358
criteria
defined 359, 360
specifying 359-363
custom *See* Custom data form
database, viewing 358
defined 356
deleting records 362-363
deleting specific records 359, 362-363
described 356-358
display 357-358
editing 358-359, 363-364
effect on database 356
field name defined 357
fields 357
finding records 359-362, 363-364
moving in 359
multiple records, searching 364
organization 357-358
parts 357-358
Data form *(continued)*
records
deleting 359, 362-363
editing 358-359
finding 359-362, 364
viewing 356
restoring changes 358
searching for specific records 359-364
simplifying 368
size limitation 356
troubleshooting 365
using 356-365
Data Form command 357-359, 362
Data Form dialog box
described 356-358
editing 363-364
Data marker *See* Chart data marker
Data Parse command 333, 336
/Data Query Criterion *See* Data Set Criteria command
/Data Query Delete *See* Data Delete command
/Data Query Extract *See* Data Extract command
/Data Query Input *See* Data Set Database command
Data series *See* Chart data series
Data series axis *See* Axis
Data Series command 93, 253-256
Data Set Criteria command 370, 372, 373, 382
Data Set Database command 349, 350, 370, 382
Data Set Extract command 370, 382
Data Sort command 171, 352, 353
Data Sort dialog box 172
Data table *See* Table
Data Table command 260-265
Data type 605-606
Database
adding records 359
changes
canceling 359
restoring 358
characters, searching for 359-364

Database *(continued)*
charts, using 352
comparison operators, using 361, 373
computed fields 348, 371, 374-377
creating 350-352
criteria *See* Criteria
data form, using, effect 356
defined 347
defining 350
deleting records
using criteria 369-378, 384-385
using data form 359-363
described 347-348
designing 349
editing 351, 358-359
extract range *See* Extract range
extracting data 381-384
features 658
field names *See* Field name
fields *See* Field
finding records
using criteria 369-378
using data form 359-364
formatting 351
formulas, using 350, 371, 374-378
functions 386-387
importing 340
large, working with 352
Lotus 1-2-3 conversion 55
matching records *See herein* finding records
multiple databases on single worksheet 351
printing 352
random sampling 378
range *See* Range
records *See* Record
size 349
sort key *See* Sort key
sorting *See* Sorting
summarizing data *See herein* extracting data
totals, summarizing with data tables 265-266
wildcard characters, using 361, 374

Date
1900 vs. 1904 date system 88, 91, 291
calculating with 88
entering 86-89, 94
footer, date inclusion 532
formatting
assigning 89, 180-183
built-in formats 86-89, 179-180
custom formats 180-183
default settings 87
Lotus 1-2-3 conversion 55
procedure 89, 180
troubleshooting 93-94
unrecognized formats 94
header, date inclusion 532
inserting automatically 100
serial numbers 88, 91, 291
series *See* Date series
symbols 87, 182, 185
system
1900 vs. 1904 88, 91, 291
changing 291
default settings 291
described 91, 291
troubleshooting 93-94
Date series 93, 254
Date system *See* Date
DAVERAGE function 386
DBF2 format 133
DBF3 format 133
DBF4 format 133
DCOUNT function 386, 387
DCOUNTA function 386, 387
DDE (Dynamic Data Exchange)
calculations, controlling 312
closing a channel 340
commands from other applications 340
controlling access 314-315
described 337-338
graphic objects, importing 522
information items 339
opening a channel 338
requesting information 339
sending data 339

DDE (Dynamic Data Exchange) *(continued)*
system software version 7.0, using 321
updating 311-314
Debugging
debug points
defined 682
removing 683
setting 682-683
macros 611, 681-684
Decimal places, fixed, specifying 102, 179, 184
Default *See specific subject*
Defined terms, online Help 19
Defining
copy areas 144
criteria ranges 370, 372, 377
databases 347
extract ranges 370, 382
names 215-224
DELETE.BAR function 646
DELETE.COMMAND function 642
DELETE.MENU function 644
Deleting
See also Clearing
arcs 517
arrows 517
cell names 217
cells 160-161
charts
arrows 469-470
as separate documents 451
axes 460
data series 444
embedded charts 448, 449
from disk 448-450
gridlines 468
legends 453-454
overlay charts 426
text 475
clearing, differences 161
columns 159
commands from menus 641
custom dialog box group items 623

Deleting *(continued)*
custom dialog box items 622
custom formats 183
custom functions 574
custom menu bars 646
custom menus 644
data series 444
database records
using criteria 369-378, 384-385
using data form 359-363
defined 159
documents 138-139
embedded objects 323
files 137-139
formula bar contents 99
glossary entries 681
graphic objects 517
Info window information 245
links 316
Lotus 1-2-3 conversion 44
manual page breaks 530
matching records 384-385
names 217, 686
notes 241
number formats 187
outlining 229
overlay charts 426
page breaks 530
password protection 559
print area 540
print titles 530-531
printing margins 540
records *See herein* database records
rectangles 517
remote reference formulas 316
rows 44, 160
saving before deleting 136
sheets from a workgroup 294-295
source areas 328
styles 205
tables 264
templates 553
text boxes 238
worksheets 138-139
Demote button 65, 227
Demoting in outlining 229-230
Dependent cells *See* Cell
Dependent worksheet *See* Linking
Descending sort order 171, 173, 353, 354
DGET function 386, 387
Dialog box
See also Custom dialog box
active area 10
Cancel button 10
check box 10, 11
command button 10, 11
contents 6, 10-11
custom dialog box *See* Custom dialog box
described 6, 10-11
described for Lotus 1-2-3 users 39
dimmed options 10
drop-down list 10-11
list box 10-11
moving in 12
OK button 10-11
option button 10-11
options, selecting 10-13
scrolling 13
text box 10-11
Dialog Editor
custom data forms, creating 365-368, 628
custom dialog boxes, creating 620-628
described 31, 620
dialog box definition 621
editing custom dialog boxes 625-627
quitting 625
starting 621
DIALOG.BOX function 626
DIF format 133
Dimmed commands 6
Dimmed dialog box options 10
Direct dependents 171, 251
Direct precedents 171, 251
Direction keys *See* ARROW keys; Movement keys
Discontinuous selection *See* Multiple selection
Disk, saving disk space 141-142
Displaying
A1 reference style 109
cells
dependent cells 171, 245, 251
formulas in 125, 206
Info window 243-245
number formats 179
precedent cells 171, 245, 251
charts
data markers 480
legends 451
procedure 394
series formulas 442
Clipboard contents 333
column headings 206-207
custom dialog box 626
custom menu bars 646-647
defined terms in online Help 19
dependent cells 171, 245, 251
documents 22
drop lines 438
entries too wide for column 93, 120, 192
formula bar 81, 104, 548
formulas
in Info window 245
in worksheet cells 119, 206
results too wide 120
full menus 9-10
graphic objects 206-207
headings 206
Help topics 17-19
hidden columns 193
hidden rows 194-195
hidden windows 26, 546
Info window 243-245
linked pictures 521
linked worksheet data 305-306, 314
menu bar 645-646
messages 614
names in Info window 244, 249

Displaying *(continued)*
notes
in Info window 245, 248, 252
in worksheets 240
numbers 84-85, 187
open documents 26
options 207
outline buttons 207, 229
outline levels 231
outline symbols 207, 229
page breaks 207
precedent cells 171, 245, 251
printing margins 537
R1C1 reference style 117
references 115-116, 117
row headings 206
scientific notation 85, 180
scroll bars 65, 546-547
series formulas 442-443
short menus 9-10
status bar 64, 545
tool bar 65, 502, 546-547
values
data markers 480
in cells 288
Info window 244
macro sheets 578, 612
worksheets 206-207
zero values 206
windows 26, 209, 547
workgroup, all sheets 295-296
worksheet gridlines 206
worksheets 61, 206, 210
workspace 546-547
zero values 206
#DIV0/! error value 122
Divergence *See* Iteration
Division operator (/) 107
DMAX function 386
DMIN function 386
Document
See also Chart; File; Macro sheet; Worksheet
access privileges, passwords 560
automatic macros 618
Document *(continued)*
closing 139-140, 431, 619
colored objects, copying between documents 558
custom color palettes, copying between documents 557
deleting 138-139
deleting password protection 561
dependent *See* Linking
displaying 22
exchanging data with other applications *See* Exchanging data
exporting 334-336
formatting *See* Formatting
hiding window 26, 546
importing 334-336
linking *See* Linking
listing of recent files 68
naming 134, 430
network documents
opening 68, 701
protecting 702
sharing 701
opening
as a workgroup 293-295
automatic 69, 549-550, 619
existing 67-69
Lotus 1-2-3 worksheets 57
network documents 68, 701
new 61-62
read-only status 562
recent worksheets 68
with password protection 560
workspace file 545
password protection 560-562
previewing *See* Previewing printing
printing 538-540
protection *See* Protection
read-only status 559
renaming 134
saving 130, 428, 548, 652
saving as workspace file 545, 547, 548
Document *(continued)*
saving in other formats 333
saving settings for workspace file 548
scrolling 69
startup document *See* Startup document
summarizing, macro 679
supporting *See* Linking
templates 551-553
types 20
workspace file, opening 548
zooming 534
Document Summary macro 679
Document window *See* Window
Documenting data sources 234-241
Dollar format 85
Dollar sign ($), currency formatting 179
Dot, cell note marker 239
DOWN ARROW key 30
DPRODUCT function 386
Dragging graphic objects 510
Drawing graphic objects 501, 502
Drive 68, 134, 139, 430, 452
Drop-down list defined 10-11
Drop line 438
DSTDEV function 386
DSTDEVP function 386
DSUM function 386
DVAR function 386
DVARP function 386
Dynamic Data Exchange *See* DDE (Dynamic Data Exchange)
Dynamic dialog box
creating 635-636
defined 635
option button groups 636
triggers
defined 635
nontriggerable items 637
using 636

E

ECHO function 614
Edit box, custom data form 366
Edit Clear command 97, 160, 264, 274, 626
Edit Copy command 97, 144, 149, 332, 439
Edit Copy Picture command 332, 518
Edit Create Publisher command 317-321
Edit Cut command 97, 142, 149, 161
Edit Delete command 161
Edit Fill Down command 149
Edit Fill Left command 149
Edit Fill Right command 149
Edit Fill Up command 149
Edit Fill Workgroup command 148, 296
Edit Insert command 159
Edit Insert Paste command 142, 144, 145, 146, 147
Edit mode described 96, 103-104
Edit Paste command 97, 142, 144-145, 149, 332, 439
Edit Paste Link command 158, 303, 310, 311, 524
Edit Paste Picture command 332
Edit Paste Picture Link command 303, 522
Edit Paste Special command 92, 135, 145, 150, 153, 440
Edit Redo command 9
Edit Repeat command 9, 97, 100, 141
Edit Select Dialog command 625, 627
Edit Undo command 8-9, 97, 99, 141
Edit Undo Paste command 157
Edit Undo Sort command 172, 354
Editing
array formulas 114, 272-273
array range 272-274
cells 95-104
chart text 479
Editing *(continued)*
charts
data series 441-442
described 438-448
embedded 393, 434
series formulas 443-444
command macros 584
data 95-104
data form 358-359, 363-364
data in a workgroup 295-296
data series 441-442
database records 351, 358-359
dialog boxes 626
embedded charts 393, 434
features 657
formulas, using names 218
multiple worksheets 101, 293-298
records, data form, using 358
repeating 97-100
tables 263-264
templates 552-553
text boxes 14, 236
undoing 99-100
worksheets
described 95
procedure 95-104
Edition, subscribing to 317-321
Elevation, 3-D chart, formatting 493
Ellipsis (...) 6, 10, 31
ELSE.IF function 599
Embedded chart *See* Chart
Embedded object *See* Embedding
Embedding
charts *See* Chart
defined 321
deleting 323
editing 393
encapsulated defined 321
from Microsoft Excel 322
objects 321-323
opening embedded objects 323
to Microsoft Excel 323
ENABLE.COMMAND function 641
Enter box, formula bar 81, 105
ENTER key 30
Enter mode 96, 103-104
Entering
See also Formula bar; Workgroup
array formulas 113-114
constants 79
data 79-80, 82-83, 90-92
data in a cell or range 82-83
data in more than one sheet at a time 293-298
dates 86-89
formulas 105-125
fractions 92, 93
logical values, as constants 92
numbers 84-86
numbers as text 89
numbers with numeric keypad 102-103
references, R1C1 style 117-118
text 89-90, 116
times 86-89
Equal sign (=)
comparison operator 107
formula initiation 106, 110
Erasing *See* Clearing; Deleting
Error, finding 243
ERROR function 595
Error handling, command macros 593-594
Error message
command macros, creating 613
custom functions, creating 569
functions 129
Error value
array constants, using 278
column width too narrow 98
command macros, arguments, converting 607
custom functions 564
described 121-125
entering as constants 92
formulas, using in 92
Lotus 1-2-3 conversion 54
returned by array functions 281
sorting order 173, 355

ESC key 30
Event-triggering for macro 691
Exchanging data
  See also Clipboard; DDE (Dynamic Data Exchange); Exporting; Importing
  described 334-336
  parsing 336
  text files 335
  with other applications 335-336
Exit command *See* File Quit command
Exiting *See specific subject*; Quitting
Expand button 228, 230, 242
Expanding outline levels 228, 230, 233
Exponentiation operator (^) 107
Exporting
  See also Importing
  databases 336
  documents 334-336
  graphic objects 524
  Lotus 1-2-3 conversion 58
  pictures, external applications 522-524
Extend mode 153
Extending selection 75, 78, 103
External reference
  See also External reference formula; Linking
  array formulas, using 278
  command macros, speeding up 615
  defined 108, 300, 302
  finding 170
  formula *See* External reference formula
  freezing values 315
  Lotus 1-2-3 conversion 54
  supporting data, displaying 314
External reference formula
  See also Linking
  defined 293
  deleting 315-316
  example 301
  freezing values 314
  functions, using 303-304
  syntax 301-302
Extract range
  creating 383
  defining 371, 383-384
  extracting data 383
  extracting records from an external database 385
  field names, creating 386
  formulas, records 385
  lookup table 386
  naming 381
  placing 386
  procedure 384
Extracting records 383

F

F1 key 34
F2 key 34
F3 key 34
F4 key 34
F5 key 34
F6 key 35
F7 key 35
F8 key 35
F9 key 35
F10 key 35
F11 key 35
F12 key 35
Features 655-665
Field
  computed criteria, valid names 374-375
  computed field *See* Computed field
  creating 349
  custom data form, types 365-368
  data form 357-358
  editing, data form 358-359
  name *See* Field name
Field name
  data form 357
  defined 348
  extract range
    creating 381-382
    matching database names 381
  length 350
  location 349
  restrictions 349-350
Field with text box, data form 357
File
  See also Document
  backup files 131-132, 429
  closing 137, 432
  deleting 137-139
  erasing, Lotus 1-2-3 conversion 49
  external applications, types supported 333
  formats
    Lotus 1-2-3 53
    types supported 132-133, 333, 664-665
  opening, Lotus 1-2-3 conversion 47
  printing 539-542
  protecting *See* Protection
  saving, Lotus 1-2-3 conversion 47
  startup files *See* Startup document
  workspace *See* Workspace file
File Close All command 137, 432
File Close command 137, 431
File Delete command 138, 451, 553
File Delete dialog box 138, 451, 553
/File Erase *See* File Delete command
File functions macro sheet, supplied functions 679
/File Import *See* File Open command
File Links command 317-321
/File List *See* File Open command
File New command 62, 553
File New dialog box 553
File Open command 67, 139, 433, 435, 557
File Open dialog box 133, 551-557
File Page Setup command 527, 528
File Page Setup dialog box 528
File Print command 213, 539-540
File Print Preview command 534
File Quit command 550
/File Retrieve *See* File Open command
/File Save *See* File Save As command
File Save As command 133, 137, 140, 429
File Save command 133, 429
/File Save Replace *See* File Save command

File Save Workspace command 69, 548
FILES function 277
Fill format 186
Filling *See* Cell; Edit Fill commands
Find Next button 164
Finding
  asterisk 169
  cells
    active cell 171
    comparison cell procedure 167-169
    described 161-162
    dependent cells 166-167
    different cells, same row or column 169
    Info window 243-245
    last cell 165
    precedent cells 166-167
    procedure 162-163
    replacing data 163-164
    specific cells and contents 164-165
    types of 71-72, 164-165
  comparison operators 359-362
  data 162
  database records 359-364, 379-381
  external references 170
  formulas 252
  information in this book ix-xi
  keyboard shortcuts 170
  question mark 169
  reverse order 377
  supporting data for linked data 316
  text 169
  values by comparison 170
  wildcard characters, using 169
Flat File macro 679
Folder
  changing 68, 134, 139, 430, 452
  managing linked documents 306-307
  startup folder 553-554
Font
  button text, formatting 587
  cell entries, formatting 178
Font *(continued)*
  chart text, formatting 477
  color *See* Color
  size, effect on column width 195
  text boxes 237
Footer
  See also Header
  aligning 531-532
  creating 531-532
  date, including 532
  default settings 527
  fonts 532
  formatting 526-528, 531-532
  printing, page layout 531-532
  time, including 532
FOR function 599
FOR.CELL function 599, 600
FOR.CELL-NEXT loop 600
FOR-NEXT loop 599
Format 3-D View command 495
Format 3-D View dialog box 495
Format Alignment command 186
Format Border command 196
Format Bring To Front command 507
Format Cell Protection command 561
Format Column Width command 192
Format Font command 377, 455, 464, 477, 587
Format Font dialog box 465
Format Group command 506
Format Justify command 188
Format Legend command 453
Format Main Chart command 412, 482
Format Main Chart dialog box 412
Format Number command 84, 89, 178, 182
Format Number dialog box 188
Format Object Placement command 509, 510
Format Object Protection command 514, 563, 564
Format Overlay command 426, 427, 482
Format Patterns command 198, 454, 464, 469, 484, 513
Format Patterns dialog box 454, 512
Format Row Height command 193
Format Scale command 461-464
Format Scale dialog box 465
Format Send To Back command 507
Format Size command 471
Format Style command 198
Format Style dialog box 207
Format Text command 478, 588
Format Text dialog box 465, 478
Format Ungroup command 506
Formatting
  3-D charts 490-495
  array range cells 273
  assigning 180
  bold 66, 177
  borders, described 194-196
  buttons 177-178, 584, 585, 587
  cell contents 175-186
  charts
    arrows 471-472
    axes 461-465
    data markers 482-489
    data series added from another chart 440-441
    described 408, 421, 451-496
    legend text 456
    legends 455-456
    plot area 490-492
    templates 435
    text 477-480
  clearing 162
  Clipboard formats 333
  colors *See* Color
  column width 191-194
  combination charts 422-426
  command macros 608
  copying 150
  currency 84-86, 179
  custom dialog box definition table 638
  custom formats
    creating 181
    deleting 183
    described 180-182, 184-187
  databases 351

Formatting *(continued)*
date
assigning 89, 180-183
built-in formats 86-89, 179-180
custom formats 180-183
procedure 89, 180
troubleshooting 93-94
unrecognized formats 94
described 84-89
displaying 244
footers 526-528, 531-532
fractions 84, 179
graphic objects 502, 503, 512
gridlines 469
headers 526-528, 531-532
italic 66, 177
Lotus 1-2-3 conversion 46
moving 141-142, 150
numbers
built-in formats 84-86, 178-179
color 179, 185
custom dialog boxes 627
custom formats 180-182
described 84-89
fractions 84, 179
General format 84
international macro sheets 653
Lotus 1-2-3 conversion 53
symbols, meaning 183
outlining 225-234
overlay charts 424, 425, 426
references, changing 117
row height 191-194
shading 196-198
styles *See* Style
templates, deleting 556
text 175-178, 186-189
text boxes 177-178, 236-237, 513
time
assigning 89, 180
built-in formats 86-89, 179-180
custom formats 180-183
described 86-87
troubleshooting 94
unrecognized formats 94

Formatting *(continued)*
workgroups 186
worksheets
described 175-205
in workgroups 186
multiple worksheets 186
saving in different formats 132, 133
Forms, custom dialog boxes, creating 629
Formula
absolute references, using 109-111
array formulas
array constants 268, 273-275, 281
creating, using 268-281
defined 106
described 269
editing 114, 274
entering 114, 117, 272, 273
external references, using 279
multiple results, producing 269
particular value, finding 281
relative references, using 279
return functions, determining 278
troubleshooting 281
arrays, command macros, using 607
automatic inserting 128
bar *See* Formula bar
canceling 111
cell ranges, referencing 115
cell references, entering 112
circular references *See* Circular reference
clearing 97, 443
command macros, editing 584
comparison criteria
combining with computed 375
data form, using 356-365
defined 371
naming 378
text, using 377
tips 378
types 371
using 371, 373-374

Formula *(continued)*
computed criteria
combining with comparison 375
data form, invalid 360
defined 371
entering 374-375
evaluating 374
fields outside tested record, using 375
naming 374
searching 375
undefined field names, using 375
using 371, 374-375
valid field names 375
copying 142-146
creating 107-108, 110-111
custom functions
calculating 570
designing 566
custom macros, entering 573
data tables, using 266
data types, using 106
databases, using 351
date, calculating 88
defined 79, 105
described 105-106
displaying 119, 206, 245
editing 218
entering 105, 110-111
error values 124
external references, using 111
extract range, results 385
finding notes 252
finding special characters 252
freezing 119, 288-289
functions, using 111-112, 125
international macro sheet conflicts 651-652
intersection operator 107, 221
linking chart text to worksheet cell 475
linking formula *See* Linking
logical values, using 92
Lotus 1-2-3 conversion 53, 128
macro sheets, displaying 572

Formula *(continued)*
maximum length 127
mixed references, using 110, 118-119
models, using 694, 695
moving, effect on references 154
names
applying to worksheets 218
editing 218
pasting 112, 218
naming
defined 219
description 215, 218
procedure 220
numbers, entering 91
one-input tables
adding formulas 261
using 258-259
operand values, converting 115-117
operators
order of evaluation 114-115
using 107-108
outlining 233
pasting functions 127
R1C1 reference style, using 117, 118
range operator 108, 224
reference operators, using 108, 116
references, using 108, 119-120
relative references, using 109-110
remote references, using 108
replacing with values
effect 288
procedure 119, 288
restoring 288
selecting 72
solving with goal seeking 282, 444
starting 78
syntax 106
table formulas 265
testing by stepping through 609
text, entering 114
time, calculating 88
too wide for columns 120
troubleshooting 120-125

Formula *(continued)*
two-input tables, using 261-262
undoing 111
union operator 107
values, freezing with 119, 288-289
Formula Apply Names command 218
Formula Apply Names dialog box 221, 222
Formula bar
activating 80-81, 98, 101, 105
canceling 99
chart data series 442-443
chart series formulas, displaying 445
copying characters 149
deleting external and remote references 320
described 23, 80-81, 105
displaying 81, 104, 548
editing
described 95, 96
procedure 96-97, 105
hiding 64, 104, 548-549
inactive 81
inserting date 101
inserting time 101
moving characters 149
moving in 95-96
selection, filling 157
using 95, 96
Formula Create Names command 217
Formula Create Names dialog box 217
Formula criteria *See* Computed criteria
Formula Define Name command 217, 221, 375, 594
Formula Define Name dialog box 218
Formula Find command 163
Formula Goal Seek command 282
Formula Goal Seek dialog box 282-283, 445
Formula Goto command 72, 103, 595
Formula Note command 239
Formula Note dialog box 239
Formula Outline command 228
Formula Paste Function command 112, 127, 572, 573, 596

Formula Paste Name command 102, 112, 218
Formula Reference command 101, 118
Formula Replace command 164
Formula Select Special command
array ranges, selecting 274
auditing, guidelines 250
dependents 166-167
described 72, 248
finding cells with specific contents 164-165
graphic objects, selecting 505
keyboard shortcuts 33, 170
last cell 165
notes, viewing 240
precedents 166-167
tables, selecting 263
visible cells only 153
Formula Select Special dialog box 168
Formula Show Active Cell command 171
FORMULA.ARRAY function 278
Fraction
entering 84, 92, 179
troubleshooting 94
Frame defined 503
Freezing
column titles 78, 212
external reference formulas 320-321
formulas 119, 288-289
remote reference formulas 323-324
row titles 78, 212
unfreezing titles 212
window panes 211
Full menus command *See* Options Full Menus command
Full menus 9
Full-page view
See also Previewing printing
described 534
switching 535
Full precision defined 91
Function
add-in functions, creating 128, 647-648
arguments 126

Function *(continued)*
- array formulas, using 278
- arrays 276-277
- capitalization 128
- consolidating data, using 329
- custom functions *See* Custom function
- database functions described 383-385
- defined 125
- error messages 129
- event-triggering macros 619
- formulas
  - pasting in 113-114
  - using with 125-129
- function not found 129
- information 584
- international macro sheet conflicts 651-652
- keys, shortcuts 30, 34-35
- linking, using 308-309
- listing 128
- lookup 267-268
- macro functions
  - defined 578
  - indenting 687
  - listing 128
- macros *See* Custom function
- nesting as arguments 126
- pasting 127, 596
- results defined 124
- scrolling 129
- shortcut keys 30, 34-35
- syntax defined 126
- troubleshooting 129
- using 125-129

G

Gallery 3-D Area command 419
Gallery 3-D Column command 420
Gallery 3-D Line command 420
Gallery 3-D Pie command 421
Gallery Area command 414
Gallery Bar command 414
Gallery Column command 415
Gallery Combination command 418, 423, 426
Gallery Line command 415
Gallery menu 408-421
Gallery Pie command 416
Gallery Preferred command 412
Gallery Set Preferred command 413
Gallery XY (Scatter) command 417
General alignment 186
General format
- date 86
- described 178, 187
- numbers 84
- time 86

GET.BAR function 639, 643
GET.DOCUMENT function 276
GET.WINDOW function 276
Getting Help *See* Online Help
Glossary macro 672, 680-681
Goal Seeking command
- formulas, solving 282-283
- names, using 283
- procedure 282
- Solver program, using 283
- when dragging chart data markers 445

Goal Seeking dialog box 283
GOTO function 580, 582, 598
Graph *See* Chart
/Graph A *See* Chart
/Graph B *See* Chart
/Graph data range *See* Chart
/Graph Name Use *See* Chart
/Graph Options Data-Labels *See* Chart Attach Text command
/Graph Options Grid *See* Chart Gridlines command
/Graph Options Legend *See* Chart Add Legend command
/Graph Options Titles *See* Chart Attach Text command
/Graph Type XY *See* Gallery XY (Scatter) command
/Graph X *See* Chart data series
/Graph XABCDEF *See* Chart data series
Graphic object
- aligning to cell gridlines 501, 513-514
- arcs 65, 499-502
- arrows 501
- border, formatting 513
- circles 53, 499-502
- combining objects 500
- command macros, assigning
  - assigning to a button or other graphic object 584-589
  - changing 587
  - described 584, 585
  - invisible object 589
  - message 589
  - multiple objects to 589
  - procedure 586
  - shortcut keys 589
  - troubleshooting 589
- copying
  - external applications 522, 523
  - procedure 512
- cutting and pasting 510
- deleting 517
- described 499
- detaching from cell gridlines 508-511
- displaying 206-207
- dragging 511
- drawing
  - multiple objects 502
  - procedure 501
- drawing tools described 65-66, 499
- exchanging described 521-524
- exporting 522-523
- fill pattern, formatting 513
- formatting
  - borders 512-516
  - described 503, 512
  - fill pattern 513
- grouping 506
- hiding 206-207, 514
- importing 522, 524
- layout grid 514-515
- lines 219, 499-500, 513

Graphic object *(continued)*
- locking 514, 563-564
- macros, assigning 512, 584-589
- moving 510-511
- object identifier defined 503
- ovals 65, 499-502
- overlapping, changing order 507-508
- placement 510-511
- protecting 564-565
- rectangles 65, 499-502
- reordering 506-507
- selecting
  - all 79, 507
  - described 73, 505
  - macro assigned to object 503
  - multiple objects 505
  - procedure 504
  - removing selection 504
  - verifying selection 505
- separating grouped graphic objects 506
- shaping objects 500
- sizing
  - described 510
  - procedure 510-511
- squares 65, 499-502
- troubleshooting 516
- working with 503-514

Greater than or equal to symbol (>=) 107
Greater than symbol (>) 107
Gridlines
- cell gridlines, aligning graphic objects to 501, 514-516
- chart gridlines
  - adding 467-468
  - defined 467
  - deleting 468
  - formatting 469
  - selecting 468
- worksheet gridlines
  - adding 206-207, 528
  - aligning graphic objects to 501, 513-514

Gridlines *(continued)*
- worksheet gridlines *(continued)*
  - color setting 206
  - displaying 206
  - hiding 206
  - printing 528

Group *See* Custom dialog box
Grouping graphic objects *See* Graphic object
Grouping worksheets *See* Workgroup
GROWTH function 276
Growth series described 254

H

HALT function 577, 597
Handle defined 503
Header
- *See also* Footer
- aligning 531-532
- creating 531-532
- date, including 532
- default settings 527
- fonts 532
- formatting 526-528, 531-532
- printing, page layout 531-532
- time, including 531

Heading
- *See also* Column; Row
- color, setting 206
- described 64
- displaying 206-207
- hiding 192-194, 206, 234
- printing 527-528

Height
- 3-D chart, formatting 494
- row *See* Row

Help
- *See also* Online Help
- balloon Help 17
- custom Help 644

Help Using Help command 18
Hidden names, automatic macros, using 224, 619
HIDE function 613
Hiding
- cells 559
- columns 192-194, 206, 234
- documents, saving 550
- formula bar 64, 104, 548-549
- graphic objects 206-207, 514
- gridlines 206
- headings 192-194, 206, 234
- macro sheets 613
- names 224, 619
- notes 240
- outlining 229, 234
- rows 192-194, 206, 234
- scroll bars 65, 546-547
- status bar 65, 546-547
- tool bar 65, 546-547
- windows 26, 546

Highlighting *See* Selecting
Hi-lo lines 437
HLOOKUP function 268, 277
Horizontal axis *See* Axis
Horizontal printing *See* Printing
Hour *See* Time

I

Icon, Excel 4
IF function 597-598
Importing
- *See also* Exporting
- databases 336
- documents 334-336
- graphic objects 522-524
- Lotus 1-2-3 conversion 51-58
- pictures, external applications 522-524

Indenting macro functions 687
INDEX function 277, 567
Info menu bar 15, 246
Info window
- closing 247
- deleting information 245
- described 26, 243-245
- displaying information 243-245
- guidelines 260
- menu bar 15, 246

Info window *(continued)*
names, checking 248-249
names, listing 249
opening 245
printing from 246, 542-543
INITIATE function 341-343
Input cell
one-input table, described 257-258
tables 263
two-input table 261-262
Input, command macros
obtaining 601-602
organizing 602
INPUT function 601-602
Inserting
cells
between existing cells 142-146
blank cells 159
procedure 144, 158-159
columns 159
Lotus 1-2-3 conversion 43
rows 159
Insertion point 81
Installing Microsoft Excel 4
International macro sheet
add-in macros 654
conflicts 651-652
creating 651-654
currency symbols 653
custom commands 654
features 662-664
moving data 654
number formats 653
procedure 652
recording 581
saving existing macro sheets as 652
user input 653
Interrupt, command macros, testing 610
Intersection operator (space) 107, 223
Italic button 66, 177
Italic format 66, 177
Item Group Box command 623
Iteration
canceling 284
circular references, solving 283-285
convergence defined 285
defined 284
divergence defined 285
limit 284
order of calculation 285
progress, displaying 285
starting 285
stopping 285
troubleshooting 284
using 283

J

Jump terms, online Help 18
Justifying text 188-190

K

Key, sort *See* Sort key
Keyboard
conventions described xiii, 29-30
custom dialog boxes, using 637
data form, editing 360
menu bar activating 7, 17, 548
scrolling with 76
selecting with 74-75
shortcuts *See* Keyboard shortcuts
worksheets, moving, selecting in 76-77
Keyboard shortcuts
See also Microsoft Excel Quick Reference
alternate keys, Lotus 1-2-3 42
array ranges, selecting 273
concepts 30
finding cells and data 170
Format Border command 32
Format Column Width command 32
Format Font command 32
Format Number command 32
Format Row Height command 33
Formula Select Special command 33, 170
Keyboard shortcuts *(continued)*
Lotus 1-2-3, translating 50
Options Display command 33
Options Calculate Now command 32
Options Workspace command 33
tables, selecting 263
using 30
Keypad, accountant's 102
Keystroke buffer *See* Macro recorder

L

Label *See* Chart text; Heading; Text
Label prefix *See* Format Alignment command
Labels, Lotus 1-2-3 conversion 53
Landscape printing *See* Printing
Last Cell option 165
Layout *See* Page layout
Layout grid, graphic objects, creating 514-515
Left alignment 186-188
LEFT ARROW key 31
Left border 196
Legend
See also Chart
adding 453-454
defined 394, 452
deleting 453-454
displaying 452
formatting 455-456
moving 454-455
selecting 453-454
text, formatting 456
LEN function 605
Less than or equal to symbol (<=) 107
Less than symbol (<) 107
Level bars, outlining 228
Line
See also Graphic Object
described 66, 499-502
Line chart
See also Chart
described 409
Line graph *See* Chart

Line style, border 196
Line tool 66, 499-502
Linear series described 254
LINEST function 276
Linking
See also Consolidating
calculation, controlling 312
cell pictures, described 518
chart text to worksheet cell 475-476
charts
pasting to another application 311
procedure 308-309
consolidating data 325-327
DDE *See* DDE (Dynamic Data Exchange)
deleting 316
dependent worksheets defined 301, 310
described 299-301
displaying
supporting data for specific reference 316
supporting documents 306
documents
in Microsoft Excel 304-316
in other applications 302, 310-311
same name 305
embedding *See* Embedding
external reference formula
defined 301
deleting 316
example 303
freezing 315-316
functions, using 304
syntax 302
external references 300, 301
formula 301-302
freezing 315-316
functions, using 303
linking formula 301-302
Lotus 1-2-3 worksheets 59
managing documents in different folders 306-307
Linking *(continued)*
names, using 318
navigating linked data 314
opening documents 305
other applications
controlling access 314
deleting 315-316
described 308-309
pasting from 311
removing 315-316
pictures, changing 521
procedure
in Microsoft Excel 302
in other applications 302, 310
ranges 303
recommendations 300
redirecting links 307-308
remote reference formula
defined 301
deleting 316
freezing 315-316
syntax 309
remote references
described 301
supporting data, displaying 316
turning off updating 313-314
removing links 315
saving 134, 304-305
saving disk space 283
supporting documents
defined 301
displaying 306
redirecting links 307-308
target file *See herein* dependent worksheets defined
to source data, consolidating 331-332
types 299
updating 305-306, 311-313
worksheets, saving 130
List box defined 11
Listing *See specific subject*
Locking
cells 559-562
graphic objects 514, 560-561
Locking *(continued)*
titles *See* Freezing
window panes *See* Freezing
windows 561-562
LOGEST function 276
Logical value
command macros, arguments, converting 606
entering as constants 92
Lotus 1-2-3 conversion 54
operand values, converting 117
sort order 173, 355
LOOKUP function 267-268, 276
Lookup functions described 268
Lookup table
compare values
ascending order 268
defined 268
described 268
extract range, using 382
functions 267-268
Looping
See also Iteration
command macros
described 598-599, 603
testing 609-613
using 598
nesting loops 603
recursion defined 603
Lotus 1-2-3
columns
deleting, equivalents 44
inserting, equivalents 44
width, changing, equivalents 45
common tasks 42-46
consolidating worksheets 329
conversion concepts 38-41
deleting, equivalents 44
equivalent terms, listing 40
exporting data *See* Exporting
file folder, changing 48
files
erasing, equivalents 49
opening, equivalents 47
saving, equivalents 47

Lotus 1-2-3 *(continued)*
formatting, equivalents 46
formula style, using 132
formulas, entering 39
graphs, equivalents 48
importing data from *See* Importing
inserting, equivalents 43, 44
keyboard, translating 42
keystroke conventions 37
linking worksheets 57-58
moving data, equivalents 42
online Help 20, 50
order of tasks 42
printing equivalents 46-47
range
erasing 45
naming 45
printing 47
rows
deleting, equivalents 44
height, changing, equivalents 45
inserting, equivalents 43
screen differences 38
system commands, equivalents 49
terms 40-41
transferring data 53-56
translating commands 50
worksheets
erasing 49
exporting 52
opening 47, 51
saving 47, 52

M

Macro *See* Add-in macro; Automatic macro; Command macro; Custom function; Macro sheet
Macro Absolute Record command 581
Macro Assign To Object command 512, 586
Macro Debugger macro 611, 682-684
Macro development feeatures 663
Macro function
See also Command macro
defined 578
listing 128
Macro Record command 579
Macro recorder 578
Macro Relative Record command 581
Macro Run command 582
Macro Run dialog box
command macros, listing 596
command macros not appearing 583
Macro Set Recorder command 580
Macro sheet
add-in file format
opening as regular macro sheet 648, 692
saving as 133, 648
using with Add-in Manager macro 676-677
alignment *See* Alignment
borders *See* Border
calculating 286, 571-572, 577-578
closing 138
columns *See* Column
combining with charts 518
command macros
hiding for speeding up 614
running 582-583
using 575-582
command tables, creating 639
creating 575-578
custom dialog boxes, copying to 624
custom functions, entering 571-575
described 575-576
displaying values 572, 578, 612
editing 95-100
features 663
formatting *See* Worksheet
formulas, displaying 578
hiding 613
international *See* International macro sheet
international command macros, recording 580-581, 658
layout, designing 616
linking *See* Linking
notes, using 608
opening 570, 577, 595
Macro sheet *(continued)*
opening at startup 550, 574
protecting *See* Worksheet
recorder range defined 578
rows *See* Row
saving 130-131
saving as international macro sheet 652
template 687
values, displaying 572, 578, 612
Macro Start Recorder command 579
Macro Stop Recorder command 579
Magnifying documents 534-535
Mail *See* Microsoft Mail
Manual calculation 286-287, 289, 290
Manual page breaks 529-530
Mapping worksheets 690
Margins
adjusting 537
displaying 537
previewing 533-534
printing, page layout 528
removing 537
Marquee
canceling 146
defined 69, 142
MATCH function 277
Matching records 359-364, 377
MDETERM function 277
Memory
conserving 135
saving in workgroups 298
Menu *See specific menu*; Full menus; Short menus
Menu bar
See also specific menu bar
activating 7-8, 15-16
alternate key, activating menu bar with 15
chart 6, 17
custom menu bar, creating 646
described 5, 64
Info 17
mouse pointer shape 29
moving across 15-16

Menu bar *(continued)*
names, listing 15
null menu bar 15
number, obtaining 644
worksheet 5, 17
Menu table, creating 642-643
Message *See* Error message; Error value
MESSAGE function 615
METAFILEPICT file format 333
Microsoft Excel
See also specific subject
features 655
installing 3
starting 4
Microsoft Excel library
add-in macros 672
described 667
samples 667-671
Microsoft Mail 341-343
Minus sign (-), subtraction operator 107
Minute *See* Time
MINVERSE function 277
Mixed reference 110, 118-119
MMULT function 277
Model
defined 693
design criteria 693-694
ease of use 695
formulas, clarity 694-695
standard layout 694
Modes
See also specific mode
described 103-104
Month *See* Date
Mouse
conventions described xiii
data form, editing 363
multiple graphic objects, selecting 504
pointer shapes 28-29
scrolling with 76-77
selecting with 74
using 27-28
Mouse pointer shapes 28-29
Movement keys
See also specific key; ARROW keys
using 74-76
Moving
cells
described 142-143
procedure 144
references, effect 154-155
troubleshooting 157
chart arrows 471
chart legends 454-455
chart text 473-474
custom dialog box 622, 626
data to/from international macro sheets 654
dialog boxes, moving in 12-13
formats 141-142, 150
formula bar
moving characters 149
moving in 95-96
graphic objects 510-511
linked data, navigating 314
Lotus 1-2-3 conversion 42
named cells, moving to 223
online Help, moving in 19
selection, moving within 76
tables 264
text boxes 511
Multiple selection
cells 77-78, 373
charts, creating 404-407
Multiple Sheet Aid macro 684
Multiple sort keys *See* Sort key
Multiplication operator (*) 107

N

#N/A error value 125, 574
Name
See also Naming
applying 218-219, 221-222, 242
auditing
checking 248-249
listing 249
built-in names, automatic translation 222
cells, copying, effect 156
Name *(continued)*
changing 685
checking in Info window 249
command macros, using 594-595, 604
command names
changing 639-640, 641
described 7
renaming 639-640
consolidating data, using 329
custom data form, defining 368
custom menus, renaming 644
database function arguments, using 387
defined 215
deleting 217, 686
displaying in Info window 249
formulas, using 115, 218
goal seeking, using 283
hidden
automatic macros, using 619
using 224
length 220
linking, using 318
Lotus 1-2-3 conversion 53
macros, using 224
pasting 112, 218
range names
applying 222
creating 216-217
renaming, Lotus 1-2-3 conversion 45
reference operators, using 223
reference types, changing 224
references, replacing 215-217
scrolling to 222
sort keys, using as 174, 356
sorting, using for 174, 356
worksheets
applying to 218-219
described 64, 134
using 220
Name Changer macro 685
#NAME? error value 123
NAMES function 277

Naming
- charts, guidelines 430
- command macros 594-595, 604
- comparison criteria 376
- computed criteria 372
- constant values 223
- criteria ranges 371-373
- custom functions 571
- dialog box definition tables 637
- fields for computed criteria 375
- formulas 219-220
- guidelines 220-222
- ranges 216-217
- relative references 224
- separators, valid 220
- styles 201
- troubleshooting 224-225
- worksheets 64, 134

NATIVE file format 333
Navigating linked data 314
Nesting
- *See also* Argument, Logical
- defined 126
- functions as arguments 126
- limit 126
- loops 603

Network
- defined 699
- documents
  - opening 700-701
  - protecting 701
  - sharing 701
- installing Microsoft Excel 699
- printing from 701
- starting Microsoft Excel 699
- worksheets, opening 68-69

NEXT function
- FOR-NEXT loops 598-599
- FOR.CELL-NEXT loops 599-601
- WHILE-NEXT loops 599-601

Nonblank cell, macro recording, effect 578
Normal style, redefining 204-205
Not equal to symbol (<>) 107
Note
- attaching 237, 239
- clearing 160
- command macros 581, 608-609
- copying 150
- creating 234-242
- defined 235
- deleting 241
- displaying 240, 245, 248, 252
- hiding 240
- markers, displaying 240
- multiple notes, creating 239-240
- printing 241
- selecting 73
- using 239-252
- viewing 240

Null menu bar 15
#NULL! error value 124
NUM LOCK key 102
#NUM! error value 124
Number
- *See also* Value
- adding 66, 107, 128
- aligning 187-188
- array constants, using 274-276
- built-in formats 86, 179
- calculating with *See* Calculation
- command macros, arguments, converting 605-606
- custom formats 180-182
- entering 84-86
- entering as text 89
- formatting
  - assigning 180
  - built-in formats 84-86, 178-179
  - colors 179, 185
  - custom dialog boxes 627
  - custom formats 180-182
  - international macro sheets 653
  - Lotus 1-2-3 conversion 53
  - operand values, converting 116-117
  - procedure 84, 180
  - symbols, meaning 183-185
- formulas, entering 91
- Lotus 1-2-3 conversion 53

Number *(continued)*
- precision 91, 291
- serial numbers for dates and times 88, 290-291
- series, entering 255-256
- sorting
  - order 173-174, 355
  - troubleshooting 174, 354

Number sign (#), custom formatting symbol 183
Number signs (###), column too narrow 93, 120, 195
Numeric keypad
- accountant's keypad feature 102
- entering numbers 103

O

Object *See* Chart; Embedding; Graphic object
OLE (Object Linking and Embedding) *See* Embedding; Linking
One-input table
- creating 257-259
- defined 256
- described 257-258
- filling in 258
- formulas, adding 260
- input cell described 257
- setting up 257-258
- using 258

Online Help
- accessing 17-18
- balloon Help 17
- commands 5, 18
- context-sensitive Help 17
- custom Help 646-647
- defined terms, using 19
- described 16-17
- displaying Help topics 20
- exiting Help 19
- getting Help 17-18
- getting help on Help 18
- jump terms, using 18-19
- Lotus 1-2-3 20, 55
- moving in 18
- using 16-17

Opening
- add-in macros 652, 696
- chart templates 435, 555
- charts 433-435
- DDE channel 342
- documents
  - automatically 551
  - network documents 559-560, 700-701
  - with linked pictures 525
- embedded objects 326
- Info window 253
- linked documents 63, 306
- macro sheets 579, 581, 599
- menus 7
- multiple windows 207-209
- network documents 559-560, 700-701
- read-only documents 321, 559-560, 700-701
- read-write documents 559-560, 700-701
- templates 332
- text files 336
- workgroups 302-303
- worksheets
  - automatic opening 76, 553-554, 623
  - existing worksheets 67
  - network 69, 700-701
  - password protection 562
  - read-only 321, 559-560, 700-701
  - recent worksheets 68
- workspaces 69, 544

Operator
- arithmetic 107
- comparison 107
- formulas, using in 108
- Lotus 1-2-3 conversion 53
- order of evaluation 114-115
- reference 108
- text 107

Option button defined 11
Options Calculate Now command 286, 288
Options Calculation command
- data tables, speeding up calculations 266
- date system, selecting 92, 290-291
- described 286

Options Color Palette command 557
Options Display command 206, 611
Options Display dialog box 206
Options Freeze Panes command 78, 211, 213
Options Full Menus command 9
Options Protect Document command 563
Options Remove Page Break command 530
Options Remove Print Area command 541
Options Remove Print Titles command 531
Options Set Page Break command 529, 530
Options Set Print Area command 540, 541
Options Set Print Titles command 531
Options Short Menus command 9-10, 102
Options Unfreeze Panes command 213
Options Unprotect Document command 563
Options Workspace command 15, 16, 548
Options Workspace dialog box 210
OR function, array formulas, finding particular values 280
Order of evaluation, formula operators 114-115
Orientation, printed page 529
Outline, border 196
Outlining
- automatic 233
- clearing 229
- collapse button 228, 250
- collapsing 225, 230
- creating 228-229
- demote button 65, 227
- demoting 229

Outlining *(continued)*
- described 225-226
- displaying 229
- displaying specific levels 230
- expand button 228, 231, 234
- expanding 225, 230
- formatting 225-234
- guidelines 233
- hiding 229, 234
- large sections, expanding, collapsing 234
- promote button 65, 227
- promoting 230
- rearranging 234
- row and column level bars 228
- row and column level buttons 228, 231
- select visible cell button 65, 227, 231-232
- show outline symbols button 65, 227-229
- styles
  - applying 233
  - automatic, controlling 232
- symbols, displaying 207, 229

Output range *See* Extract range
Oval
- *See also* Graphic object
- described 66, 499-502

Oval tool 66, 499-500
Overlay chart
- *See also* Chart
- adding 422-425
- changing 425
- creating 424-427
- custom charts, adding to 425
- data series 426
- defined 422
- deleting 426
- formatting 424, 425, 426
- guidelines 426
- new chart, changing to 424
- using 423

P

Page
  breaking *See* Page breaking
  layout *See* Page layout
  previewing *See* Previewing printing
Page breaking
  automatic 529
  checking 533-536
  displaying 207
  manual page breaks 529-530
  removing manual breaks 529-530
Page layout
  centering 528
  charts, sizing 528
  controlling 527
  footers 528, 532-533
  gridlines 528
  headers 528, 532-533
  margins 528
  orientation 528
  setting 528
Page setup
  dialog box, displaying 527-529
  procedure 529, 538
Pane *See* Window
Paper size 529
Parenthesis
  number formatting 81, 104
  using with formulas 118, 128
PARSE function 340
Parsing 340
Password
  assigning 134, 558, 560, 564
  described 559
  existing document, replacing 560
  network documents 701
  protection password defined 559
  read-only status 561
  removing 561
  replacing 560
  types 134
  worksheets
    opening 69
    protecting 134
  write reservation password defined 559
Pasting
  See also Copying, Moving
  cells 144-146
  Clipboard contents 120
  command macro names 603
  custom functions 573
  functions to formulas 111, 127, 596
  multiple copies with one operation 147-148
  names 112, 218-219
  nonblank cells only 153
  paste area 142, 145
  troubleshooting 157-158
Pattern
  See also Shading
  chart data markers 484
  chart text, formatting 478-479
Pausing, macro recording 579
Percent sign (%)
  cell formatting 84
  custom formatting symbol 184
  percentage operator 107
Period (.), custom formatting symbol 184
Perspective, 3-D chart 493-494
Picture
  camera tool described 66
  cells
    copying to external applications 522-524
    linked, changing 521
    linking 520
    unlinked, copying 519-520
  charts *See* Picture chart
  charts as pictures 519-520, 523
  defined 518
  file formats 333
  linked documents, opening 523
  recommendation 521
Picture chart
  See also Chart data marker
  changing 489
  clearing 489
  defined 485-486
Picture chart *(continued)*
  replacing data marker with picture 488
  scaled 485, 487-488
  stacked 485, 486-487
  stacked and scaled 485, 486-488
  stretched 486-487
  using 480-485
Pie chart
  See also Chart
  described 409
Placeholder 207
Plot area
  See also Chart
  described 395, 490-491
  formatting 490-492
  selecting 492
Plot order argument, chart series formulas 446, 447
Plus sign (+), addition operator 107
PM, custom formatting symbol 185
Point mode
  described 95, 104
  entering 121
Pointer *See* Mouse
POKE function 339
Portrait printing *See* Printing
Precedent *See* Cell
Precision As Displayed check box 91, 289
Precision for calculation 91, 289
Preferred chart *See* Chart
Preview window
  actual-size view 534-537
  closing 538-539
  full-page view 534-537
  opening 534
  scrolling 535-537
  switching views 535
Previewing printing
  actual-size view
    defined 534
    scrolling 536-537
    switching 535
  closing window 538-539
  described 533-535
Previewing printing *(continued)*
  full-page view
    defined 534
    returning 535
    scrolling 535-536
    switching 535
  margins 537
  procedure 213, 534
  scrolling 535-537
  sizing 535
  switching views 537
  zooming 534-535
Print area 540-541
/Print Printer Borders *See* Options Set Print Titles command
/Print Printer Footer *See* File Page Setup command
Print Printer Go *See* File Print command
/Print Printer Header *See* File Page Setup command
/Print Printer Margins *See* File Page Setup command
/Print Printer Range *See* Options Set Print Area command
Print titles 530, 531
Printer
  installing 526
  selecting 526-527
  setting up 525
Printing
  canceling 540
  charts
    aligning 528
    procedure 496, 539-540
    sizing 528
  column
    headings 528
    titles 530-531
    width handles 537-538
  databases 352
  described 525, 539-540
  features 656
  footers 527, 531-532
  from preview window 541
  gridlines 528
  headers 527, 531-532
Printing *(continued)*
  headings 528
  Info window 256, 544-545
  landscape 531
  Lotus 1-2-3 conversion 46-47
  margins *See* Margins
  multiple worksheets 546
  network documents 701
  notes 241, 541
  page breaking *See* Page breaking
  page layout *See* Page layout
  page setup *See* Page setup
  previewing *See* Previewing printing
  print area defined 540
  print titles 530-531
  procedure 539-542
  ranges 540-541
  ranges, Lotus 1-2-3 conversion 46-47
  row
    headings 528, 531
    titles 530
  troubleshooting 542
  worksheets 213, 539-541
Product support xiv
Promote button 65, 227, 230
Promoting in outline 230
Protection
  add-in macros 678
  cells
    display differences 562
    locking 559
  charts 430, 556-562
  data 559
  displaying 244
  documents 556, 560-561
  graphic objects
    locking 514
    setting 560
  hiding data *See* Hiding
  locking
    cells 559
    graphic objects 514, 560
    windows 560-561
  password *See* Password
Protection *(continued)*
  removing 558
  setting 559
  windows 560-561
  worksheets 134, 559-560
Publishers 317-321

Q

Question mark (?)
  custom formatting symbol 183
  database searching, using 361
  pointer shape, online Help 18
  wildcard character
    criteria, using with 361, 374
    finding text 169
Quit *See* File Quit command
Quitting
  See also Closing
  Data Find 379
  Dialog Editor 624
  Microsoft Excel 50
  online Help 19
  workgroup session 296

R

R1C1 reference style 108, 117-118
Range
  array *See* Array range
  cells, copying, effect 156
  clearing, Lotus 1-2-3 conversion 48
  command macro, defining 580
  command macro, recording
    determining 580
    multiple columns 580
  criteria range *See* Criteria, range
  data, entering 80, 82-83
  database *See* Database
  defined 348
  defining 348, 350, 370
  extract range
    creating field names 384
    defining 381-382
    defining on another worksheet 383
    described 381

Range *(continued)*
extract range *(continued)*
extracting data 382-383
formulas in records, results 383
lookup tables, using 384
procedure 381-382
filling 149, 187
linking 303
Lotus 1-2-3 range commands 45
named ranges, Lotus 1-2-3 54
names
applying 218, 219, 21-222
creating, Lotus 1-2-3 conversion 45
deleting 217
Lotus 1-2-3 conversion 54
operator 108, 223
outlining, selecting ranges 228
printing 540-541
references
abbreviations 116
in formulas 115
selecting 71-72
/Range Erase *See* Edit Clear command
/Range Format General *See* Format Number command
/Range Justify *See* Format Justify command
/Range Label-Prefix *See* Format Alignment command
/Range Name Create *See* Formula Define Name command
/Range Name Delete *See* Formula Define Name command
/Range Name Labels *See* Formula Create Names command
Range operator (:) 107, 223
/Range Protect *See* Format Cell Protection command
Read-only access
See also Network
described 558, 701
Read-only document 316, 558, 701
Read-write access
See also Network
described 558, 701
Ready mode 95, 103
Recalculating *See* Calculation
Record
See also Database
adding to database 349-350
adding with data form 359
changes, canceling, data form 359
consistency 350
creating 347, 349, 350
defined 347
deleting 359-363, 369-378, , 384-385
editing with data form 358
extracting 380-384
extracting from external database 383
matching 359-364, 379-381
matching with data form 362, 363
number indicator, data form 358
searching
data form 364
moving horizontally 380
procedure 379
reverse order 379
specific records 380
updating, procedure 381
viewing with data form 356-358
Recorder range
defined 578
extending 582
Recorder Range Out of Room error message 582
Recording macros
command macros 578-580
international macros 580, 652
out of room error 582
pausing 580
procedure 579
range, determining 580
stopping 589
Rectangle
See also Graphic object
described 66, 499-502
Rectangle tool 66, 499-502
Recursion, command macros, self-starting 603
#REF! error value 124
Reference
abbreviating ranges 116
absolute references *See* Absolute reference
area 22
changing to R1C1 style 117-118
circular, solving *See* Iteration
command macros
arguments, using as 604
converting references to values 603
copying, effect 155-156
defined 108
external references *See* External reference
formulas, using 108-111
inserting 121
Lotus 1-2-3 conversion 53-54
mixed references 110, 118-119
naming 224
operators 107, 116
R1C1 style, converting to 117-118
relative references *See* Relative reference
remote references 107
replacing with names 222
styles 107, 117
types described 109
Reference area 22, 63, 81
Reference operators 107, 116, 223
REGISTER function 649-650
Relative reference
See also A1 reference style; Absolute reference
array formulas, using 278
changing 118-119
command macros
converting from absolute 581
converting references to values 604
moving selection with 607
defined 109
formulas, using 109, 110
naming 224
Remote reference *See* Linking; Reference

Remote reference formula
See also Linking
deleting 316
described 301
supporting data, displaying 310
syntax 309
Removing links 315
Removing splits 210
RENAME.COMMAND function 644, 653
Repeating
actions 9, 100
commands 9, 100
editing 100
Replacing *See specific subject*
REQUEST function 339
RESULT function 566
Results, functions, defined 126
Retrieving *See* Opening
RETURN function 577, 596
Right alignment 186-188
Right angle axes, 3-D chart, formatting 494
RIGHT ARROW key 31
Right border 196
Rotation, 3-D chart, formatting 494
Row
blank rows 158-159
charting 400-404
copying, transposing 152-153
deleting 44, 160
finding different cells 170
headings
described 64
displaying 206-207
hiding 192-194, 206, 234
printing 527-528
height
adjusting 194
hiding 194
setting 193
text wrapping 191
hiding 192-194, 206, 234
inserting
described 158-159
Lotus 1-2-3 conversion 43
Row *(continued)*
maximum number 61
outlining
demoting 229
displaying 231
hiding 233
levels 230-231
promoting 230
row level bar 228
row level button 228, 231
symbols 207, 229
print titles 530-531
ranges, naming 216
selecting 73-75
series
entering in multiple rows 255-256
entering in single row 255
sorting 353-354
titles, freezing 85, 212
transposing 152-153
ROW function 277
ROWS function 277, 567
RTF file format 333
Running head *See* Header

S

Sales tracking sample 672
Sample models and macros
add-in macros 672-692
amortization table 669
billing template 668
break-even analysis 668-669
budget 669-670
college expense planning 670
library 667
sales tracking 661
Saving
automatic 678
before deleting 143, 385
calculating before saving 290
charts 427-430
command macros before editing 588
Saving *(continued)*
documents
as workspace file 545, 548
file formats 132-133, 333, 664-665
non-Microsoft Excel formats 339
linked documents 141, 312, 325
Lotus 1-2-3 conversion 52, 57
macro sheets as add-in macros 652
templates 553, 555
worksheets
backup files 131-132
described 129-130
different format 132-133
Lotus 1-2-3 worksheets 57
procedure 130-131
quick procedure 131
troubleshooting 143
without calculating 293
workspace file 136, 547-548
Scaled pictures, chart data markers 487-489
Scaling chart axes 461-464
Scatter chart *See* XY (scatter) chart
Scientific notation format 85, 180
Scroll arrow 23
Scroll bar
described 24, 77, 357
displaying 65, 546-547
Scroll box 23
Scrolling
active cell, scrolling to 171
Data Find command mode 380
Data Find mode, moving horizontally 380
described 76-78
dialog boxes 12
freezing titles 78
functions 129
keyboard, using 78
mouse, using 77
names 223
previewing printing
actual-size view 536-537
full-page view 535-536

Scrolling *(continued)*
previewing printing *(continued)*
procedure 537
to specific page 537
text boxes 14
to named area 223
window panes 211
worksheets 27, 76-78
worksheets with multiple windows 208
Searching *See* Finding; Matching records
Second *See* Time
Select defined xii
Select visible cells button 65, 227, 231
Selecting
array ranges 73, 574
blanks 73
cell contents 69-75
chart
arrows 470
axes 435-437, 461-462
data markers 481
gridlines 468
items 435-438
legends 436, 454
objects 456
text 437-438, 474-475
columns 75, 161
constants 72, 80
custom dialog box items 621-622
dependents 166-167
described 69-70
dialog box options 10-13
extending selections 71, 75, 106
filling selections 149, 157
finding named areas 78-79
formula bar *See* Activating
formulas 72
graphic objects 73, 79, 503-507
gridlines 468
keyboard procedure 74-75
last cell 73, 165
menu bar *See* Activating
mouse procedure 74
moving within selection 76
Selecting *(continued)*
multiple selections 77-78, 404-407
notes 73
plot area 492
precedents 166-167
printer 526-527
ranges 71-72
returning to previous location 72
rows 73-75
selection types 70
templates 555
window *See* Activating
Selection
creating charts 481
defined 69
extending 71, 75, 106
filling 149, 157
multiple selections 71
Selection tool 66, 504
Semicolon (;), array constants, row separator character 274
SEND.KEYS function 340
Separating grouped graphic objects 506
Separator character, array constants 274
Series *See* Chart data series; Date series
Series formula
See also Chart
contents 446-448
creating 446-448
defined 446-448
displaying 442-443
editing 443-444
external absolute references, using 448
SERIES function 441-442, 447-448
Series name argument, chart series formulas 447
Set Recorder command 578
SET.NAME function 601
SET.VALUE function 567, 601, 630
Setup
installing Microsoft Excel 4
printers 525
startup folder, creating 549-550
Shading
See also Pattern
adding 197-198
described 196
Shape *See* Graphic Object
Sheet *See* Macro sheet; Worksheet
SHIFT key combinations 34-35
Shifted commands 7, 8
Short Menu command *See* Options Short Menus command
Short menus 9-10
Shortcut key
command macros 581
lists 37
Show outline symbols button 65, 227-228
SHOW.BAR function 645
Single-input table *See* One-input table
Sizing
chart arrows 471
custom dialog box group items 623
custom dialog box items 622
dialog boxes 626
documents 30
graphic objects 510-511
printing 534
worksheets 26-27
SLASH (/) key
division operator 107
menu bar, activating 16
Slide Show macro 686-687
Slowing down command macros 614
Solver 283
Solving formulas with goal seeking 282
Sort key
defined 171, 352
maximum number 171, 352
multiple keys
more than three keys 172-173, 354
using 172-173, 353
names, using 174, 355
selecting 172, 353
sort order 173, 353
Sort order 173, 353

Sorting
ascending order 180, 354
capitalization, effect 350
descending order 180, 354
described 179, 352
keys *See* Sort key
logical values 181, 355
more than three keys 180, 354
multiple keys 180, 354
names, using 181, 355
order 179, 353
procedure 179-181, 353
sort order 179, 353
troubleshooting 182, 355
types 353
undoing 180, 354
Sound Notes macro 672
Source area *See* Consolidating
Space
custom formatting symbol 184
intersection operator 107, 223
Split boxes described 24
Splitting windows
described 24, 209-210
procedure 210
removing splits 210
Spreadsheet *See* Worksheet
Square *See* Graphic object
Square, cell note marker 238, 240-241
Stacked pictures, chart data markers 485-489
Standard File Dialogs macro 672
Starting
command macros from other command macros 602
command macros, recursive self-start 603
Microsoft Excel 4
Microsoft Excel on network 699
Startup document
add-in macros 648
canceling 554
creating 549-550
workspace file 548-549
Startup folder 549-550
Static text, custom data forms 366
Status bar
described 23, 64
displaying 65, 545
hiding 65, 547
Step button, command macros, testing 583, 609
STEP function 610
Stepping, command macros
procedure 609-611
testing 611-613
Stopping
command macros 583
FOR-NEXT loops 599-600
WHILE-NEXT loops 600
Stretched pictures, chart data markers 485-489
String *See* Text
Structured programming practices, macros, indenting 607
Style
applying 199-200
attributes 199-200
border styles 197
copying 202
creating 194-195, 200-202
defined 198
deleting 205
names, using 201
Normal style, redefining 204-205
outlining
applying 232
automatic styles 232
redefining 203-205
text boxes 237
Style box 65
Subroutine macro *See* Command macro
Subscribers 17-321
Subtraction operator (-) 107
SUM function 125
SUMPRODUCT function 277
Supporting document *See* Linking
Switching Info window to worksheet 246
SYLK file format 138, 333
Symbol
number formatting, meaning 183-186
outlining, displaying 229
Syntax
See also specific function
formulas 105
functions 126

T

TAB key 30
Table
See also One-input table; Two-input table
calculating, speeding up 265
clearing 264
creating 257-266
data table defined 256
database, totals summarizing 267-268
defined 256
deleting 264
editing 264
formulas, using 267
input cell defined 257
input values, adding 363
lookup tables *See* Lookup table
Lotus 1-2-3 conversion 56
moving 264
one-input table *See* One-input table
recalculating 263
selecting 263
two-input table *See* Two-input table
values
adding to tables 263
clearing 264
converting 264
substituting 261
Target cell *See* Cell
Target file *See* Linking
Template
add-in macros 648
charts 435, 551-553
creating 551-553
defined 551
deleting 553
described 551-553
editing 552-553
opening 552
samples 667-671

Template *(continued)*
saving 553, 555
selecting 555
temporary, naming 552
using 552
worksheets, creating 551, 696
TERMINATE function 337, 340
Testing
command macros 583, 609-613
databases 349
formulas 611, 612
Text
aligning 186-188, 191
array constants, using 274-276
bold 66, 177
button text
alignment 190, 584
formatting 587
cells
entering 89-90
size limit 89
chart legend, formatting 455
chart text *See* Chart text
color 176
command macros
arguments, converting 605
references, using as 601
skipping text 600
comparing criteria using 372, 377
copying to text files 111
defined 80
exporting/importing Dat File macro to 679-680
files
from other applications 335
parsing 336
to other applications 335
finding 169
formatting 175-178, 186-189
formulas, entering in 114
italic 66, 177
justifying 188-190
numbers, entering as text 89
operand values, converting 117
operators 107

Text *(continued)*
parsing 336, 684
sorting order 173, 353, 355
wrapping 91, 187, 191
Text box
adding 235-236
aligning 190, 237
copying text 241
creating 235-236, 499
defined 11, 234
deleting 238
described 227, 234-235
displaying 206-207
editing 14, 236
formatting 177-178, 236-237, 513
hiding 206-207
moving 511
Text box tool 66, 236
TEXT file format 333
Text operators 107
Three-dimensional chart *See* 3-D chart
Tickmark *See* Chart
Tilde (~), wildcard characters, using for searching 171, 374
Time
12 hour clock 87
24 hour clock 87
calculating with 88
default settings 80, 87
entering 86-89
header, time inclusion 531
formatting
assigning 89, 180
built-in formats 86-89, 179-180
custom formats 86-87, 180-183
described 180-183
troubleshooting 94
unrecognized formats 94
header, time inclusion 531
inserting automatically 100
series, creating 93, 254
symbols 87, 179, 180-183
troubleshooting 94
Title
freezing 78, 212
print titles 530-531
unfreezing 212

Title bar
data form 359
described 22
Tool bar
aligning text, numbers 188
alignment buttons 65-66, 188
arc tool 65-66, 499-502
auto-sum button 65-66, 120
button tool 65-66, 584-586
buttons described 65-66, 227
bold button 65-66, 177
camera tool 65-66, 520
chart tool 65-66, 394
demote button 65-66, 227
described 22, 65-66
displaying 65, 502, 546-547
formatting text, numbers 177
graphic objects, drawing 499-502
hiding 502, 546-547
illustration 65
italic button 65-66, 177
line tool 65-66, 499-502
multiple graphic objects, selecting 504
outlining, applying 227-229
outlining buttons 228-229
oval tool 65-66, 499-502
promote button 65-66, 227
rectangle tool 65-66, 499-502
select visible cells button 65-66, 111-113
selection tool 65-66, 501
show outline symbols button 65-66, 228
style box 65-66
styles
applying 198-200
creating 200-202
summing, automatic 65-66, 128
text box tool 65-66, 235
tools described 65-66
Tools *See specific tool*; Tool bar
Top border 196
Tracepoint
defined 682
macro debugger macro 611, 682-684

Translate utility *See* File Open command
TRANSPOSE function 277
Transposing columns, rows 152, 153
TREND function 272, 277
Trigger *See* Dynamic dialog box, Event-triggering for macro
Troubleshooting
array formulas 280
borders 198
cells, copying 157-158
charts 431, 496, 542
column width 93, 195
command macros 583-589
command macros assigned to button, graphic object 589
consolidating data 330
custom functions 574
data form 365
database functions 387
dates 93-94
formulas 120-125
fractions 94
functions 129
graphic objects 516
iteration 284
naming 224-225
numbers, displaying 93
pasting 157-158
printing 542
sorting 183, 355
Typing dates, time of 330
time 94
Two-dimensional chart *See* Chart
Two-input table
creating 261-262
defined 256
described 256, 261
filling in 262
input cells described 257
input values, adding 263
TYPE function 569
Typeface *See* Font

U

Unattached text *See* Chart text
Underline (_), custom formatting symbol 184
Undo command *See* Edit Undo command
Undoing
actions 8-10, 99-100
commands 8-10, 99-100
consolidating 331
editing 99-100
formulas 111
sorting 172, 355
Unfreezing titles 212
Unhiding *See* Displaying; Hiding
Union operator (,) 107, 223
UP ARROW key 31
Updating
DDE links 311-313
linked worksheets 311-313
turning off 313

V

Value
array ranges, converting 273
calculating displayed vs. stored 91
constant value *See* Constant value
custom functions, incorrect, testing 579
displayed values, calculating with 280
in tables, top 111
extracting from arrays 280
finding, by comparison 170
formulas, converting 116-117
freezing 288
Lotus 1-2-3 conversion 54
macro sheets, displaying 572, 578
replacing formulas 288
table values, converting 264
zero 206
Value axis *See* Axis
#VALUE! error value 125
Values argument, chart series formulas 447
Vertical axis *See* Axis
Vertical printing *See* Printing
Vertical split box 212
View, actual-size vs. full-page *See* Previewing printing
Viewing 3-D charts 495
Visible cells selection button 153
VLOOKUP function 266-267, 277

W

WAIT function 614
"What-if" analysis
advancing variables 689
described 256-257
existing data sheet 689
goal seeking 282-283
macro 688-689
new data sheet 688
What If macro 688-689
WHILE function 601
WHILE-NEXT loop 600-601
Width *See* Column
Wildcard character
consolidating data, using 333
criteria, using with 361, 374
database, using 362
searching for 375
using for finding text 169
Window
activating
hidden windows 46, 546
procedure 44-45
visible windows 18, 546
window behind other windows 45
active window defined 21
arranging 26
closing 137
chart window *See* Chart
commands 26
described 22-24
displaying 26, 209, 547
hiding 26, 546
Info window *See* Info window
locking 562-562

Window *(continued)*
multiple
arranging 684
horizontal arrangement 684
references, tracing 685
multiple windows to worksheets 207-209
opening *See* Opening
panes 27, 209-210
preview *See* Preview window; Previewing printing
protection
removing 561
setting 560
scrolling 27
sizing 27
splitting 27, 209-210
types described 20
unhiding 26, 546
worksheet window parts described 22-23, 63-64
Window Arrange All command 26, 209
Window Arrange Workgroup command 209
Window Hide command 26, 550
Window More Windows command 25
Window New Window command 26, 207
Window Show Clipboard command 102, 333
Window Show Document command 246
Window Show Info command 240
Window Unhide command 26
Window Workgroup command 295
WINDOWS function 277
WK1 file format 133
WK3 file format 133
WKS file format 133
Workgroup
adding, deleting sheets 294-295
commands 296-297
copying data 296
creating 294-295
defined 293
Workgroup *(continued)*
displaying all sheets 295-296
ending session 296
entering data 295-296
formatting 186
identifying 298
memory, saving 298
WORKGROUP function 277
Worksheet
alignment 186-187
auditing 242-243, 690
borders 196
calculating
procedure 287
saving without calculating 290
cell contents formatting 176
circular references *See* Circular reference
closing 137
column *See* Column
combining with charts 518
comments 234-235
comparing worksheets 691-692
creating 61-62
database use *See* Database
date system, changing, effect 291
deleting 138-139
dependencies, tracing 691
dependent worksheets defined 309
described ix, 61-62
display
changing 206-207
described 61
options 207
settings 207
workgroup sheets 295
document type 20
editing 95-104
features 656-658
formatting 175-205
formulas
displaying 119
replacing with values 288
functions *See* Function
gridlines *See* Gridlines
Worksheet *(continued)*
grouping *See* Workgroup
Info window, switching with 246
information, obtaining 691
linking *See* Linking
Lotus 1-2-3 conversion 51-52
mapping 691
memory, conserving 135
menu bar 5, 15-16
multiple windows
arranging 209
opening 207-209
scrolling 208
multiple worksheets *See* Workgroup
names
changing 685
defining 216-217
described 64, 134
using 220
notes, using 238
numbers, entering 84-86
opening
as workgroups 294-295
automatic opening 69, 548
existing worksheet 67-68
Lotus 1-2-3 worksheets 51
network 68-69, 700-701
protected worksheets 69
recent worksheets 68
outlining
automatic styles, controlling 232
cells, selecting 231
clearing 229
collapsing 230
creating 228-229
demoting 229-230
described 225-226
displaying, hiding 229
displaying, specific levels 231
expanding 231
formatting 226
guidelines 233
hiding rows, columns 233

Worksheet *(continued)*
outlining *(continued)*
large sections, expanding, collapsing 233
promoting 230
rearranging 233
styles, applying 232
using 229-234
page breaking 207, 530-537
parts described 63-64
password protection 134, 556-559
print area 540-541
printing
described 213
multiple worksheets 542
procedure 213, 542
sections of worksheet 540-541
protecting 134, 556-559
read-only status 558, 701
row *See* Row
saving
automatic 678-679
backup files 131-132
described 129-130
different folder 134
different format 132-133
linked worksheets 135, 305
Lotus 1-2-3 conversion 57
procedure 130-131
quick procedure 131
without calculating 293
scrolling 27, 76-78, 208, 211
series 253
shading 196-198
size
checking 79, 138
maximum 61
startup folder 549-550
supporting, defined 309
templates, creating 551-553
titles *See* Title
troubleshooting 143
updating, linked worksheets 311
using as template 551
viewing, multiple windows to single worksheet 207-209
Worksheet *(continued)*
windows
displaying 209
new, opening 209
workspace file defined 546
Worksheet Auditor macro 690-691
/Worksheet Column Hide *See* Column
/Worksheet Column Reset-Width *See* Format Column Width command
/Worksheet Column Set-Width *See* Format Column Width command
Worksheet Comparison macro 691-692
/Worksheet Delete Column *See* Edit Delete command
/Worksheet Delete Row *See* Edit Delete command
/Worksheet Global Column-Width *See* Format Column Width command
/Worksheet Global Default Printer *See* File Page Setup command
/Worksheet Global Format General *See* Format Number command
/Worksheet Global Format Text *See* Formatting
/Worksheet Global Label-Prefix *See* Format Alignment command
/Worksheet Global protection *See* Options Protect Document command
/Worksheet Insert Column *See* Edit Insert command
/Worksheet Insert Row *See* Edit Insert command
Worksheet menu bar described 5, 15
/Worksheet Page *See* Options Set Page Break command
Worksheet select all box described 23
/Worksheet Titles *See* Options Freeze Panes command
/Worksheet Window Clear *See* Splitting windows
/Worksheet Window Horizontal *See* Splitting windows
/Worksheet Window Vertical *See* Splitting windows
Workspace
arranging windows 26
customizing 544-549
Workspace *(continued)*
defined 544
described 23
displaying 546-547
hiding 546-547
opening 69, 544
saving 136, 547-548
settings, changing 547
Workspace file
creating 69, 544-549
current Microsoft Excel version required 548
information contained 548
macros, using 548-549
naming 558
opening 544
saving 136, 547-548
startup document 549-550
startup folder 549-550
Wrapping text 91, 191
Write reservation password defined 134

X

X-axis *See* Axis
XY (scatter) chart
See also Chart
creating 398
described 398
plotting coordinates 401

Y

Y-axis *See* Axis
Year *See* Date

Z

Z-axis *See* 3-D chart; Axis
Zero, custom formatting symbol 183
Zoom button 535
Zooming, previewing printing 535